

MODERN PLASTICS

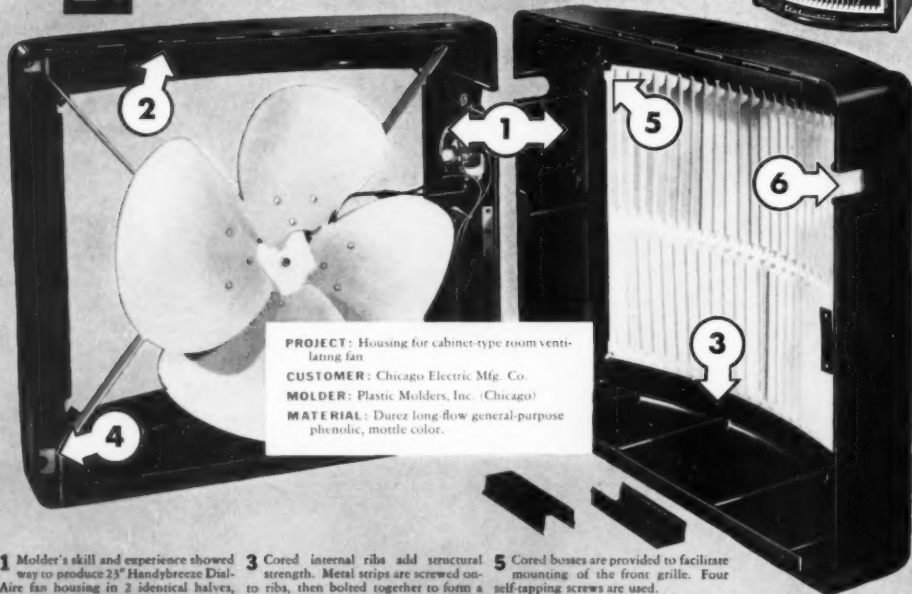


DECEMBER 1950

It pays to use your custom molder's know-how

... here it led to Tooling, Die, and Assembly Economies

No. **24** in a Series on Plastics Skill at Work...



PROJECT: Housing for cabinet-type room ventilating fan

CUSTOMER: Chicago Electric Mfg. Co.

MOLDER: Plastic Molders, Inc. (Chicago)

MATERIAL: Durez long flow general-purpose phenolic, mottle color.

1 Molder's skill and experience showed way to produce 25" Handybreeze Dial-Aire fan housing in 2 identical halves, using one single-cavity mold.

2 Alternating groups of tongue and groove sections along the inner edges (4 male and 4 female repeated) form a secure hidden joint.

3 Cored internal ribs add structural strength. Metal strips are screwed on to ribs, then bolted together to form a rock-firm housing assembly.

4 Molded-in metal inserts at the four corners support the fan and motor assembly. Insulated with rubber grommets, they provide a floating mount.

5 Cored bosses are provided to facilitate mounting of the front grille. Four self-tapping screws are used.

6 Convenient handles are formed by two side slots on each molding. Spring-fitting safety guards serve to protect the mechanism.

● A good way to wrap up and forget numerous manufacturing problems is to combine the all-round ingenuity of a good custom molder and the all-round properties of Durez phenolic plastics.

You may save time and money... by-pass finishing operations... make your product look better and serve better. This king-size fan housing shows very well what we mean.

Through imaginative tooling, the molder made it possible to produce

both halves of the complete cabinet from one single-cavity mold. This approach held the tooling period and die costs to a minimum. Ingenious provision for fitting the pieces together produced an easily assembled job with the great rigidity a large portable fan should have.

Despite its size... it is molded from an 18-pound charge, and measures 20" x 23" x 14" assembled... the Durez cabinet has high dimensional stability.

Durez comes from the mold with a beautiful lustrous "molded-in" finish and seldom requires costly fabrication or finishing operations. Its excellent mechanical, electrical, and chemical properties are available in a wide variety of combinations for particular needs.

Use your molder's know-how when you plan for low-cost, time-saving production. And call on the wide experience of Durez phenolics technicians without obligation.

Our monthly "Durez Plastics News" contains many useful ideas. May we place you on the list? Durez Plastics & Chemicals, Inc. 1212 Walsh Rd., N. Tonawanda, N. Y.




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PROTECTIVE COATING RESINS

PHENOLIC PLASTICS THAT FIT THE JOB



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Whether the proposed product be small or large, simple or involved... versatile CATALIN STYRENE commends itself as the *one* material best qualified to fulfill your important manufacturing specifications! Its lightness-of-weight factor, stability, excellent molding behavior, finishing qualities—and favorable cost, for example—provided the *lift* so necessary in the initial development and present production of the now highly successful and very hospitable Traymaster*. Skillfully designed, this exquisite, automatic service tray is an assembly of molded transparent CATALIN STYRENE elements... accented for decorative enhancement, with touches of gold or silver plating.

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ONE PARK AVENUE • NEW YORK 16, N. Y.

*A Karoff Original
Produced by Plastics Engineering Co., R. I.
for Novelty Utilities, Inc., N. Y.



MODERN PLASTICS*



VOLUME 28

DECEMBER 1950

NUMBER 4

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Another new development using

B. F. Goodrich Chemical Company raw materials

**Stick
up**

**-FOR
SALES!**



LET an idea-man work with Geon materials, and he'll come up with a new sales-maker! Take the decal pictured here, for example. It's made from Geon paste resin which helps give it these revolutionary advantages.

This decal can be made transparent, translucent or opaque. It adheres to glass and enameled, glossy, painted or metal surfaces—*without* adhesive. A wipe with a damp cloth keeps it clean. It can be easily removed, leaves no mark or stain and is reusable. It can be made in a variety of thicknesses, cut in many shapes, printed in brilliant colors.

And see how economical and versatile Geon paste resin is! You need no heavy or expensive mixing equipment for it; it is easily dispersed in plasticizers. No volatile solvents are required. You can mold, cast, or use it for coating and dipping. And you can get the qualities you want—flexibility, toughness, resistance to aging and abrasion, chemical inertness. Color range is unlimited.

Geon paste resin is used for making coated upholstery, dolls and toys, coatings for plating racks, prosthetic devices, linings for chemical tanks. Its versatility may give you an idea that we can help you turn into profitable sales.

We make no finished products—supply raw materials only. But technical advice is yours for the asking. Just write Dept. GA-12, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco.



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BIG?

Yes...but that's only part of the story

CHICAGO MOLDED PLASTICS

Anyone with a press large enough might mold a big plastic part. But...how many...how fast...and how consistently perfect?

Here at Chicago Molded the volume production of extra large plastics parts is a substantial part of our business...and has been for years. We have a knowledge of methods, materials and techniques that comes only through experience. We have every needed type of equipment including giant presses of the most modern design for compression, injection and plunger molding. So...size and quantity present no problem.

For instance, the large Motorola TV cabinet measures $17\frac{3}{4}" \times 19\frac{1}{2}" \times 18\frac{1}{16}"$ and weighs 22 lbs. net. Yet we're turning out hundreds of them every day. Many of the large parts shown below were first produced years ago and some are still in production. No...quantity is no problem. You say how many and we'll deliver as fast as needed to meet your schedules.

As for quality...we have but one standard...the best in molded plastics. It's a standard that has caused the biggest names in industry to select Chicago Molded as a primary source of supply year after year. So...why not discuss your next job with a Chicago Molded engineer? There's no obligation...and you'll find it time well spent. Just write or phone.



CHICAGO MOLDED PRODUCTS CORPORATION

1046 N. Kolmar Ave., Chicago 51, Illinois

**COMPRESSION, INJECTION AND PLUNGER
MOLDING OF ALL PLASTIC MATERIALS**





Influence Is Expensive—But Necessary

On several occasions during the past few years, MODERN PLASTICS has used its editorial page to urge that the Plastics Industry do something serious and big about public relations.

We did not mean then and do not mean now only that kind of public relations which creates consumer interest in plastics products—publicity write-ups of marvelous new plastics products in consumer magazines, news reports of “developments” in materials, etc. We did mean and do mean public relations in their broadest sense, including government relations, industrial relations, press relations, radio relations, and educational relations.

Publicity per se is not enough today. It may be a sad peculiarity of our present political economy, but it is a fact that government and, indeed, political relations can have even more profound effects on the well-being of an industry than can press relations directed toward the consuming public.

Particularly in a period of mobilization when scarce raw materials must be allotted to industries, the general influence of each industry at all levels is most important. Influence is not obtained by pleas or cries of anguish or by bombast or even by sincere appeals to logic after lack of influence has resulted in threat of damage to an industry. Influence is built by the day-to-day use of proper public relations on a broad enough basis and a big enough

scale to secure the attention and understanding of all parties whose appreciation is of value.

The kind of public relations the Plastics Industry needs costs big money. Industries competing with the Plastics Industry for industrial good will in all directions are spending ten, twenty, and more times as much money on really broad public relations programs as is this industry.

The very least that individual companies in the Plastics Industry can do by way of self protection in this field is to see that this industry has the best and the broadest public relations program that can be afforded.

The basic coordinating machinery for such a program exists in the Society of the Plastics Industry, and S.P.I. is doing a marvelous job of dollar-stretching in the press relations field. All that is needed is a high-level policy committee to plan a properly scaled public relations program, sophisticated direction of the program, and adequate funds to finance the program.

That kind of money can be secured only through a greatly increased membership in S.P.I. But many, many companies not now members of S.P.I. stand to benefit most from a public relations operation of this scale. Joining the S.P.I. is an easily understood and relatively low cost form of business insurance at a time when the public relations of an industry are more important than those of any individual company in that industry.

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MINIATURE PARTS
*to Precision
Tolerances*

METAL STAKING
Stays Tight!

That's Why
INSUROK T-725

IS USED IN THIS HIGH-FREQUENCY FUNCTION SWITCH

MADE BY GRIGSBY-ALLISON COMPANY

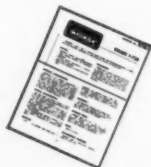
For this four-way function switch, which selects AM, FM, phono, or TV, Grigsby-Allison had to find an insulating material which would punch readily into intricate shapes. It had to possess high impact strength so that metal T-slugs, staked by a special method, would not loosen. Finally, because of the high frequencies involved, excellent electrical properties were needed in the material—even after sanding to close tolerances.

INSUROK T-725 has just the right combination of properties to meet these requirements. Equally impor-

tant, Grigsby-Allison engineers can depend on these properties remaining uniform from shipment to shipment.

In hundreds of similar applications, laminated and molded INSUROK are solving difficult problems for industry. Investigate INSUROK for your product, today.

**Write for
Descriptive Data Sheet.**



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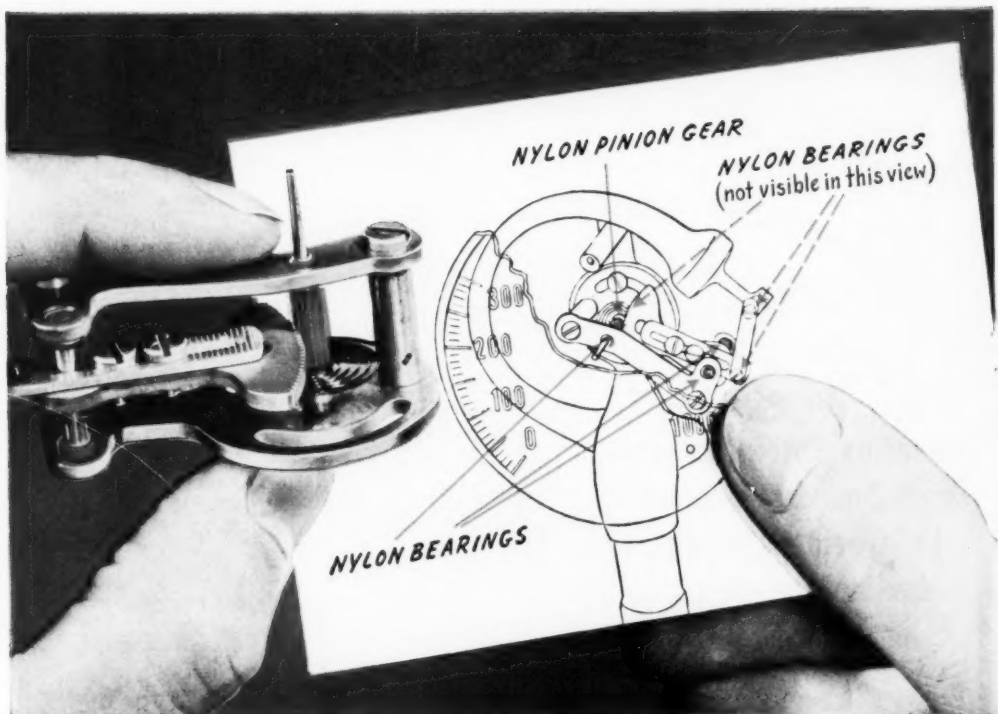
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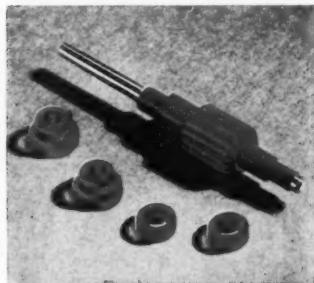
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ABSORB SHOCK...RESIST WEAR...GIVE LONG LIFE

Severe vibrating and pulsating will wear down the mechanism of an ordinary pressure gauge . . . cause it to register inaccurately. To produce a gauge that would operate with utmost efficiency over extended periods,



NYLON PINION is machined from blank injection-molded directly onto metal shaft by Plastic Mfrs. Corp., Stamford, Conn. Nylon bearings are machined from rod stock supplied by the Polymer Corp., Reading, Pa. Accuracy of the gauge is guaranteed by its manufacturer to within one half of one per cent of dial graduation over entire scale of a full 270° dial arc.

Manning, Maxwell and Moore developed a "nylon movement" for their Ashcroft "Duragauge." Five years of extensive field testing prove that the nylon movement outperforms and outlasts other gauge movements under severe conditions of vibration, pulsation and fretting corrosion.

Nylon parts offer an extremely low coefficient of friction. Too, nylon is highly resilient . . . resists abrasion. It absorbs vibrations without passing them along. Under shock loading, nylon's "plastic memory" allows parts to return to original size . . . maintains accuracy.

A large chemical company installed one of these gauges on "the worst pulsating service to be found." After 10 months of continuous use, the gauge was removed. Under microscopic examination, the nylon movement showed no visible wear!

Durable nylon plastic is finding more and more uses in gears, bearings, and machine parts for textile

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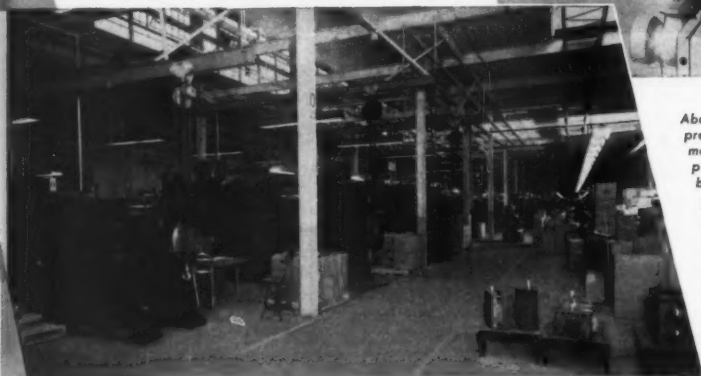


BIG ORDERS...LITTLE ORDERS
BIG PIECES...LITTLE PIECES

Erie has 23 injection molding presses, from 2 oz. to 80 oz. capacity, to provide efficient production for every injection molding job.



Above: Three large presses capable of molding the largest pieces required by manufacturers.



Left: Section of Molding Room showing 12 ounce, 28 ounce, and 32 ounce machines.

One of a series of advertisements describing Erie Resistor's complete facilities for quality custom injection molded plastics.

Erie's newly enlarged battery of 23 injection molding presses mean more than quantity production. They make possible an elasticity in production planning that turns out your requirements with the greatest possible efficiency and economy.

A short run of a small piece may be produced most economically on a two-ounce press. A large order for the same piece may be produced more economically with a multiple die on a

larger press. And our largest presses, capable of molding 80 ounces of polystyrene in a single injection, are used not only to mold the largest single pieces required; they make it possible to speed production of smaller pieces by molding several at a "shot."

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Plastics Division
ERIE RESISTOR CORP., ERIE, PA.
 LONDON, ENGLAND • • • TORONTO, CANADA



THE NEW JOHNSON "GLO-COATER"

IS CELANESE* ACETATE PLASTIC

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Are you planning a promotion for your product? Keep in mind the quality and cost advantages to be had through Celanese fast molding acetate. It's a *premium* plastic in more ways than one. Your Celanese representative can give you technical and practical assistance. Celanese Corporation of America, Plastics Division, Dept. 1-L, 180 Madison Avenue, New York 16, N. Y. In Canada: Canadian Cellulose Products Ltd., Montreal and Toronto.



Molded by Milwaukee Plastics Inc., Milwaukee, Wis.
and General Electric Company, Decatur, Illinois



Celanese
PLASTICS

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* Send Westchester one-pound samples of the vari-colored materials representative of colors you normally run, stating preference on shades to be custom-compounded. Westchester will match samples and return "swatches" for approval.

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And with your scrap, Westchester can re-color, pearlize, metallize, or tinsellize, and blend into uniform flowing material the scrap or re-grinds from different runs of the same material.

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PLASTICS INC.**

MAMARONECK, NEW YORK

Phone: Mamaroneck 9-0080

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Reed-Prentice injection molding machines, operating on a 24-hour 6-day week basis, play the leading role in molding parts for the Magnus Portable Electric Reed Organ—the latest triumph in plastics for Finn H. Magnus, founder and president of Magnus Harmonica Corporation of Newark, N. J.

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If you have an injection molding problem, why not benefit from the experience of the leader in the injection molding machinery field. Call in a nearby Reed-Prentice representative; he will be glad to assist you.

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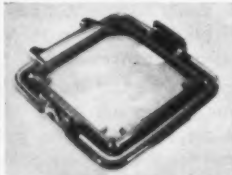

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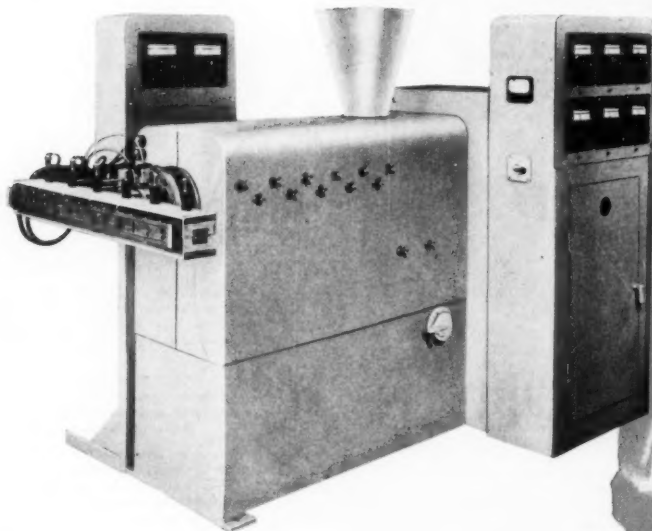
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Molding Powders • Bonding Resins • Cements

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MPM EXTRUDERS

give thoroughbred performance



'WAY AHEAD of the field on every count, MPM extruders give the consistently top performance you expect to get whenever you put your money on the line.

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and versatile radial cooling systems are your guarantees that MPM extruders will finish in the lead regardless of which extrudable material is being processed.

You can bet on this, too: No extruder is more versatile than an MPM. Wire covering, extrusion of films, sheets, monofilaments, and cross-sections, and compounding and coloring are just a few of the jobs MPM extruders handle.

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15 Union St., Lodi, N. J., U. S. A.
Cable Address: MODPLASEX



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ALL PLASTICS RAW MATERIAL SUPPLIERS
May You Have A Long and Useful Life!



*And a Merry Christmas and
Happy New Year to all our
Customers. May you never
lack for Aspirin.*

BOONTON MOLDING co.

BOONTON, NEW JERSEY N. Y. Office—Chanin Bldg., 122 East 42nd Street, Murray Hill 6-8540

Modern Plastics

A COMPLETE LINE OF PLASTICS MOLDING MACHINERY

From
to

2
200 oz.

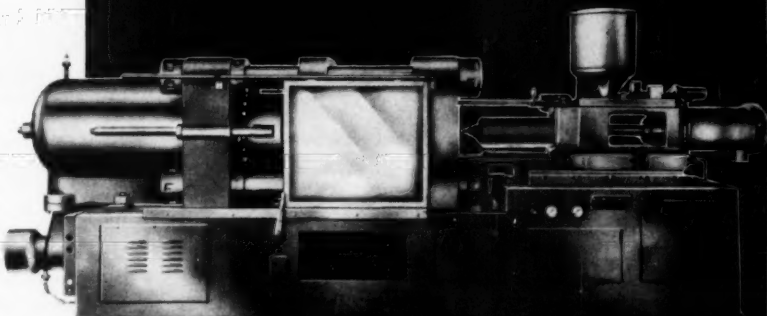
...and, all are obtainable from one source of supply—Watson-Stillman.

Since the very inception of the industry over 50 years ago, Watson-Stillman engineering ingenuity has paced the industry, year after year, with outstanding plastics molding machinery advancements.

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Horizontal Injection Molding
Machines—8 to 200 Ounces



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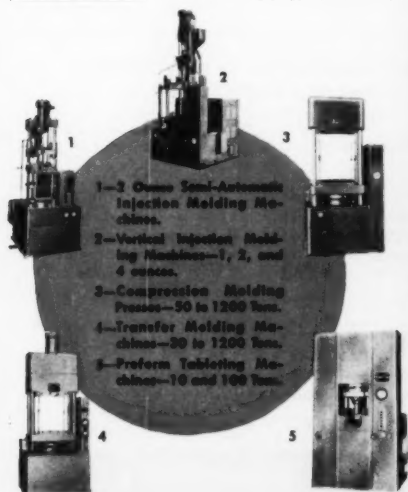
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		Spokane 8, Wash.	Mach. & Tool Supply Co.

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9 K 17A



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Injection Molding
Machines.

2—Vertical Injection Molding
Machines—1, 2, and
4 ounces.

3—Compression Molding
Presses—50 to 1200 Tons.

4—Transfer Molding
Machines—50 to 1200 Tons.

5—Preform Tabling
Machines—10 and 100 Tons.

MANUFACTURERS OF THE MOST COMPLETE LINE OF HYDRAULIC MACHINERY



silene EF[®]



When you require
an extender for light vinyl film—
excellent resistance to abrasion and marring—
an anti-sintering agent

Silene EF is proving its value continually in the plastics field. Its unique properties unfold many new opportunities to make better plastic products at less cost. Silene EF, for example, is outstanding as an extender for light vinyl film, imparts high abrasion and mar resistance in the compounding of floor tile. Silene EF puts more sell in finished products because it improves their appearance and durability by preventing discoloration, brittleness and disintegration.

Silene EF proves its worth also as an anti-sintering agent in molding powders. Time and labor are saved because Silene EF makes regrinding or reworking unnecessary.

Why not try Silene EF in your operations? Complete information and working samples are obtainable by writing Pittsburgh Plate Glass Company, Columbia Chemical Division, Fifth Avenue at Bellefield, Pittsburgh 13, Pennsylvania.



A Guide to the Properties You May Be Seeking

APPROXIMATE ANALYSIS—SILENE EF

Silene EF is a white, very finely divided, precipitated hydrated calcium silicate with the following approximate analysis:

SiO ₂	69.0	Bulk Density—Lbs.	
CaO	18.9	per cu. ft.	10 ± 2
Loss on Ignition	15.0		
pH in water suspension	9.6	Oil Absorption	130-130
Specific Gravity	2.1	Particle Size	Average 0.03 micron
Refractive Index	1.475		

COLUMBIA

CHICAGO • MINNEAPOLIS • BOSTON
NEW YORK • CINCINNATI



CHEMICALS

ST. LOUIS • CHARLOTTE • PITTSBURGH
CLEVELAND • PHILADELPHIA



PAINT • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

FOR Custom-Moulded TEFLON PARTS LIKE THESE . . .



SEE US!

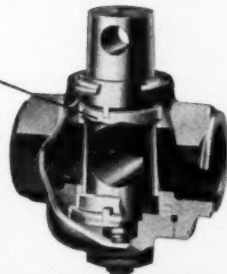
This Teflon valve liner, moulded by Kurz-Kasch for The Duriron Company, Inc., takes full advantage of this most chemically inert of materials. It resists all known acids, alkalis, etc. Nothing known adheres to it. It will withstand a temperature of 500° F. continuously. It has zero water-absorption. It is non-toxic. And its moulded-in wax-like surface permits free turning without lubricants. Inasmuch as Teflon's electrical properties are also outstanding, applications in the chemical, electrical and food processing industries are suggested.

Here's the catch. Teflon cannot be moulded by conventional methods. Some parts are produced by machining, but this has drawbacks where a smooth wax-like surface is required. From the outset, we have worked closely with Durco engineers to produce parts such as these with uniform wall thickness, flange, and taper inside and out by a proved moulding technique. It consists of pressing preforms, sintering at 700° F., and coining.

If you're interested in Teflon—or any other thermo-setting material—talk to a moulder who has grown up with them. We don't pretend to know all the answers, but we'll honestly, sincerely appraise your problem.

Moulded Teflon liners shown ¼ actual size.

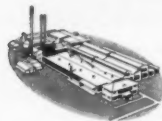
TEFLON LINER



This revolutionary Durco Plug Valve, with its Kurz-Kasch-moulded Teflon liner, realizes to the fullest the astounding characteristics of this new material. It is virtually leak-proof, self-lubricating, and operates with high sealing pressure, full-opening round parts and a high safety factor. It will deliver better performance over longer periods.

Kurz-Kasch

FOR OVER 34 YEARS PLANNERS AND MOULDERS IN PLASTICS



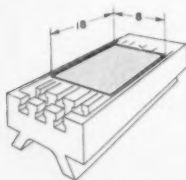
Kurz-Kasch, Incorporated • 1415 South Broadway • Dayton 1, Ohio

BRANCH SALES OFFICES: New York, Lexington 2-6677 • Chicago, Harrison 7-5473 • Detroit, Trinity 3-7050 • Philadelphia, Granite 2-7484 • Dallas, Lakeside 1022 • Los Angeles, Prospect 7503 • St. Louis, Delmar 9577 • Toronto, Gladstone 5491.
EXPORT OFFICE: 89 Broad Street, New York City, Bowling Green 9-7751.

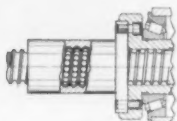
Cleans up the ears too!



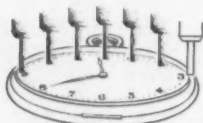
Universal cutter head... can be swiveled to the angle most advantageous for milling fine details.



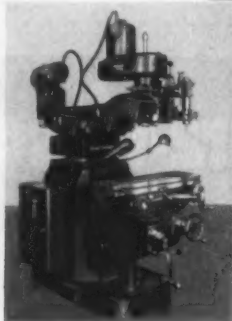
In one setting, without repositioning the cutter head, work or master, chips can be cut throughout an area of 8" x 18".



Antifriction feed screws for cross and longitudinal movements reduce the effort of turning handwheels to almost zero.



Extra sensitive automatic depth tracing unit of CINCINNATI 8" x 18" Tool and Die Milling Machine will trace over any master without marring it.

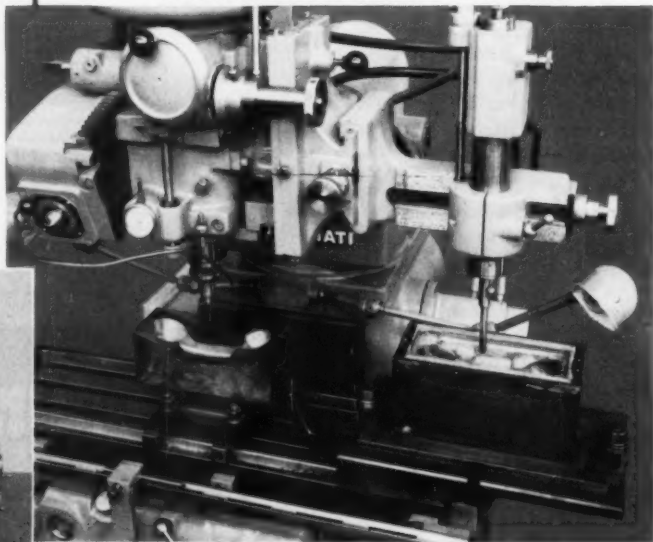


Attention to small details like ears may irk junior, but it's an important consideration to doll manufacturers. And for a good reason. The hob to produce a mold for the face and ears is milled in one setting of the work. Performing the operation on a CINCINNATI 8" x 18" Tool and Die Miller offers the advantage of a wide swivel adjustment of the spindle head, giving the operator a chance to obtain fine detail in the ears... the face is easy. (Note drawing at upper left.) Hand finishing time on the hob is greatly reduced; appearance of the finished product improved. You'll find this feature extra useful when necessary to reproduce fine detail on an angular or curved surface, and for conventional milling operations required to complete dies and molds. Other cost reducing features are illustrated at the left. More information may be obtained by writing for catalog No. M-1620-1.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES
BROACHING MACHINES • FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID



Milling the die for a telephone part on a CINCINNATI 8" x 18" Tool and Die Milling Machine.

first for convenience...

PITTSBURGH PX PLASTICIZERS

in the quickly identifiable *Color-coded* drums

DiIsoOctyl Phthalate PX 108

DiButyl Phthalate PX 104

DiOctyl Phthalate PX 138

TetraHydroFurfuryl
Oleate PX 658

DiNonyl Adipate PX 209

DiIsoOctyl Adipate PX 208

TriCresyl Phosphate PX 917

TriPhenyl Phosphate PX 916

DiIsoOctyl Sebacate PX 408

DiButyl Sebacate PX 404



Only *Pittsburgh* gives you this real *plus* value when you buy plasticizers!

For only *Pittsburgh* PX Plasticizers are delivered in brightly painted drums—*coded* in a combination of *drum* color and *top* color to show at a glance the *exact* contents of the drum.

No more mix-ups in shipping, delivery, handling, and storage! No more using the contents of a wrong drum because the label was removed, obscured, or misread. The contents of each drum of *Pittsburgh* PX Plasticizer can be quickly and easily identified all the way, all the time!

A display card showing this color code, and giving important commercial information as well, has been prepared! Copies of this, suitable for posting in your warehouse, receiving dock, or mixing room, are available upon request.

Pittsburgh PX Plasticizers

PX-104 DiButyl Phthalate
PX-108 DiIsoOctyl Phthalate
PX-138 DiOctyl Phthalate
PX-208 DiIsoOctyl Adipate
PX-209 DiNonyl Adipate
PX-404 DiButyl Sebacate
PX-408 DiIsoOctyl Sebacate
PX-658 TetraHydroFurfuryl Oleate
PX-916 TriPhenyl Phosphate
PX-917 TriCresyl Phosphate

Check the above list for your needs—then write today for individual bulletins which give full commercial and technical information about each of the *Pittsburgh* PX Plasticizers.



Plasticizer Division

PITTSBURGH COKE & CHEMICAL COMPANY

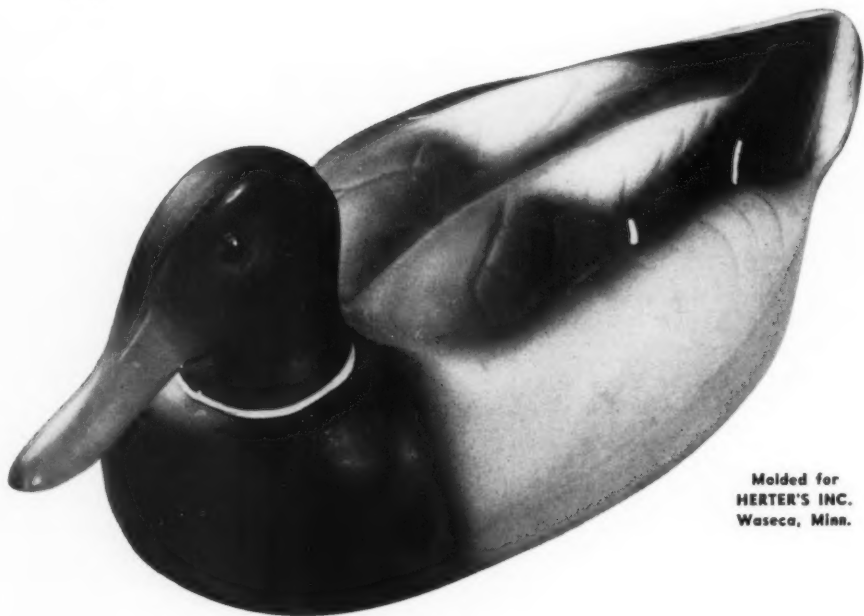
Grant Building • Pittsburgh 19, Pa.

COKE • CEMENT • PIG IRON • PLASTICIZERS • COAL CHEMICALS • ACTIVATED CARBON • PROTECTIVE COATINGS
AGRICULTURAL CHEMICALS • SYNTHETIC ORGANIC CHEMICALS





I'M THE
REAL DECOY!



Molded for
HERTER'S INC.
Waseca, Minn.

The original model for this plastic decoy was carved by a nationally famous expert on water fowl. All of the fine detail was then carefully duplicated in the injection molded product. This amazingly life-like decoy is durable, light in weight and economically produced.

We would welcome the opportunity to work out your particular plastics problem.



MINNESOTA PLASTICS CORP.

366 WACOUTA • ST. PAUL 1, MINN.

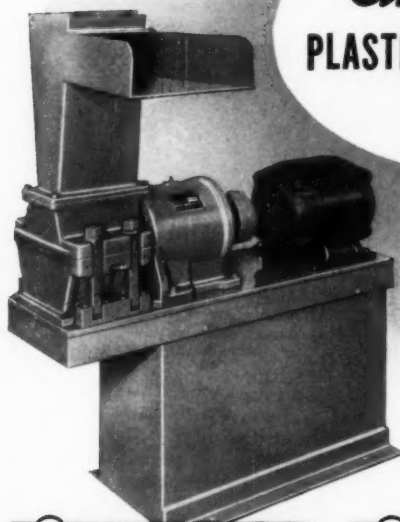
There's a model designed for *your* method of operation

HIGHLY EFFICIENT

EASY TO CLEAN

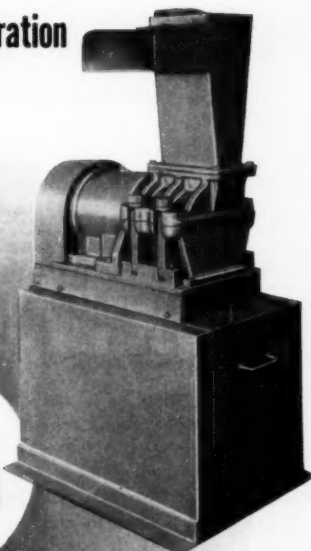
RUGGED

Cumberland PLASTICS GRANULATING MACHINES



DIRECT COUPLED
(Model 1/2 Illustrated)
FOR CENTRAL GRINDING

Used primarily when scrap material is transported to a central area for the granulating operation. Capacity is large in proportion to size of machine. Available in Models 0, 1/2, 1-1/2, and 18.



V-BELT DRIVEN
(Model 1/2 Illustrated)
**FOR USE BESIDE
EACH INJECTION
MOLDING MACHINE**

Saves handling costs. Prevents contamination of material. Occupies less floor space. Material container is built-in. Available in Models 0 and 1/2 only.

For complete information, request Bulletin 250.

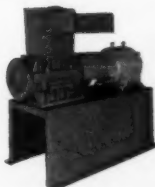
CUMBERLAND



ROTARY CHOPPING MACHINE

Heavy duty, rugged machine. Used for cutting thick vinylite slabs from two roll mills. Also used as large capacity pelletizer. Other applications are described in Bulletin 400.

CUMBERLAND



GRANULATING MACHINE MODEL 18

Large capacity. Double hung construction. Easy to inspect, dismantle, and adjust. Further details are in Bulletin 250.

CUMBERLAND



PELLETIZING MACHINE

Smaller, companion model to Rotary Chopper. Designed specifically for use with continuous extruders. Request Bulletin 500.



California Representative:

WEST COAST PLASTICS DISTRIBUTORS, INC.
2325 Jesse Street, Los Angeles 23, Cal.

PLASTICS MACHINERY BULLETIN

Reporting News and Machine Design Developments

IN BUSINESS TO



REDUCE YOUR COSTS

NEW NRM TWO-STAGE EXTRUDER ELIMINATES INITIAL COMPOUNDING AND DRYING

Saves time and premium cost securing special short order mixtures

Another NRM "first" to further simplify extruding operations . . . to save on production time . . . to cut your manufacturing costs. Once again the pioneer in its field, the new NRM Two-Stage Extruder introduces a new development for drying and extruding pre-blended wet acetate acrylic and polystyrene compounds to be pelletized direct at the die or in a chopper.

By eliminating the need for initial compounding and drying, it now becomes possible for any plant to mix its own compounds to customer's specifications and at lower cost. In addition, less expense is involved for maintenance and labor formerly needed to operate more expensive equipment.

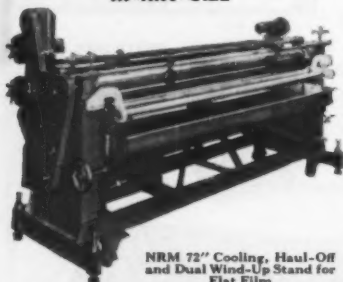
Premium costs of specially mixed short orders are no longer necessary. Compounds can be quickly made from a simplified inventory of basic materials such as resins, plasticizers, stabilizers, fillers and dyes.

Substantial savings in production time can be realized also with the new NRM

Two-Stage Extruder. Shorter delivery can be quoted since reliance on outside sources for availability of ingredients and compounds is avoided.

The first single screw extruder to incorporate colloidizing, devolatilizing and extruding, this new development is similar in design and operation to standard NRM plastic extruders. Existing NRM extruders now operating in the field can be modified to incorporate the many time and cost saving features of the new NRM Two-Stage machine. For complete details, simply write Plastics Machinery Division, National Rubber Machinery Company, Akron 8, Ohio.

ELECTRICALLY HEATED EXTRUDER PROVIDES POLYETHYLENE FILM IN ANY SIZE



NRM 72" Cooling, Haul-Off and Dual Wind-Up Stand for Flat Film

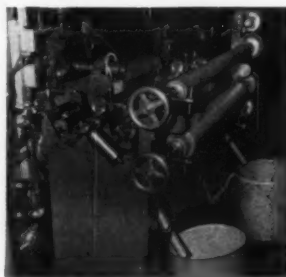
NRM Haul-Off and Wind-Up Units cool, trim and wind up polyethylene film at a rate of 250 to 300 pounds per hour . . . have a thickness range of .001" to .010" and maintain tolerances of plus or minus 5%. They are available in 48" and 72" sizes.

Haul-off and wind-up sections are powered by a $\frac{3}{4}$ h.p. variable speed drive to suit the size of extruder used in connection with the machine. Dies for polyethylene film used with this take-up fit all sizes of extruders and are available complete with heaters and controls.

The cooling tank is stainless steel and is adjustable vertically so that it can be

lowered to facilitate adjusting the die.

Haul-off section includes rubber covered "nip" rolls, idler tension roll, chrome plated trim roll and one set of rotary trimming knives. Dual wind-up section has two spindles arranged for quick, easy exchange of full rolls, driven by an adjustable slip clutch to compensate for build up on roll and equipped to accommodate standard cardboard core.



Close-up View of NRM 48" Dual Take-up for Polyethylene Film

For maximum plant flexibility, the equipment is designed to be compact, light yet rugged . . . occupies little floor space and can be moved on casters. The working position, however, is on jack screws. Additional data is available. Write Plastics Machinery Division, National Rubber Machinery Company, Akron 8, Ohio.

Equipment For Polyethylene Lay-Flat Expanded Tubing

The wind-up is available in 48" and 72" sizes, complete with dies for all sizes of extruders.

To get complete details, write Plastics Machinery Division, National Rubber Machinery Company, Akron 8, Ohio.

NATIONAL RUBBER MACHINERY CO.

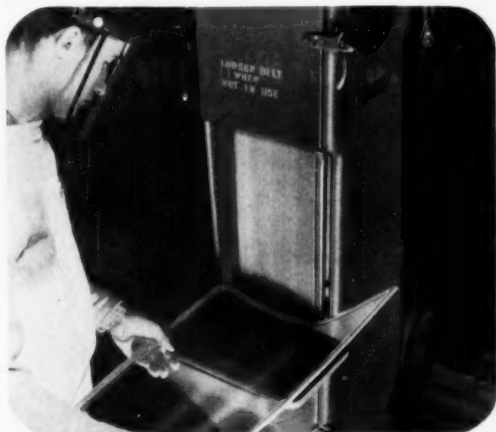
General Offices & Engineering Laboratories
Akron 8, Ohio

PLANTS at Akron and Columbiana, Ohio and Clifton, N. J.
AGENTS East: National Rubber Machinery Co., Clifton, N. J.
West: S. M. Kipp, Box 441, Pasadena 18, Calif.
EXPORT Plastics Machinery: OMNI EXPORT CORPORATION
460 4th Ave., New York 16, N. Y.

*Creative
Engineering*



COATED PRODUCTS COMMENTS



SPECIAL savings with this SPECIAL belt

Waterproof Cloth Belts by CARBORUNDUM are specially designed for the wet sanding of plastics, and other ductile materials subject to plastic flow. They produce savings not possible with general-service belts—and do it through such special advantages as:

- Maintenance of constant cutting rate throughout belt life.
- Smooth-running splices.
- Superior finish.
- Low belt "wet-stretch"—less down-time for tensioning adjustment.
- Reduced power loss at drive pulley, through greater traction resulting from backing treatment.

See your CARBORUNDUM representative for full details about these and other cost-saving advantages of Waterproof Cloth Belts by CARBORUNDUM. The Carborundum Company, Coated Products Division, Niagara Falls, N. Y.

COATED ABRASIVES BY

CARBORUNDUM

TRADE MARK

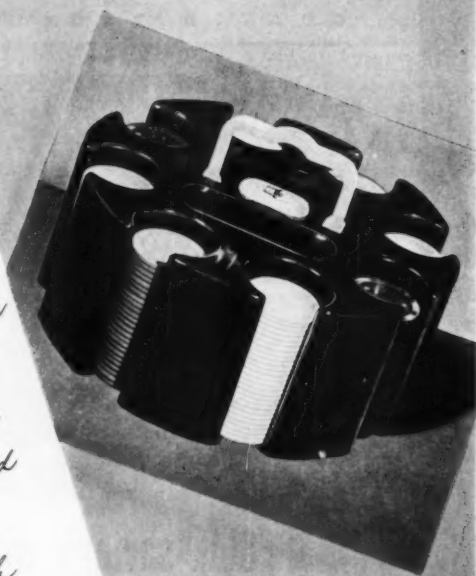
Making ALL abrasive products...
to give you the proper ONE

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Design Licks A Problem
Problem--To design and produce an eye catching and economical Poker Chip Rack--Divided rack into trim parts and main body for two color assembly. Hot-stamped nameplate conceals restricted-flow spruce gate. Gate provides good mottle effect and minimum of weld lines. Reduced weight, but maintained strength through proper wall thickness. Result--Improved economy and appearance



Kingsway Revolving Poker Chip Rack molded for Kingsway, Inc., Chicago, Ill.

Take a note from the many customers who, by repeating orders from year to year, have indicated their complete satisfaction with molding done for them by Industrial Plastics. Ask us to explain what our thorough engineering and design means in terms of your product's cost and performance. Ask us to prove what we can do for you. Write today. No obligation.

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A Division of
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Marvinol[®] vinyl resins
put more buy-appeal
in these products



"Dry hand" and stitch-tear resistance makes Marvinol-based calendered sheets pleasant to touch, lasting, easy to work.



High physical properties and ease in processing, printing, embossing and heat-sealing are found in cast, calendered or extruded Marvinol-based films.



Resistance to cut-through, good electrical qualities and rapid extrusion rates are the extras Marvinol formulations offer extruders.

Sharply detailed Marvinol-based products are made by injection, low pressure, compression, slush and blow molding processes.



In new vinyl sponging operations, Marvinol formulations are being used for tough, lightweight cellular products.



Smart, colorful, long-wearing floor coverings are made from Marvinol-based formulations.



MARVINOL vinyl resins put buy-appeal in your products from the start. For superior physicals, Marvinol VR-10. For ease in processing, plus good physicals, Marvinol VR-20. Both resins offer you stability under heat, light and time; dimensional stability; low temperature flexibility; resistance to abrasion, wear, tear, oils and acids. Let us show you how to use Marvinol's timesaving features. All technical information developed in our modern laboratories is at your disposal, since it is through you that Marvinol reaches the consumer. Write today for the latest technical information. Dept. M-12, NAUGATUCK CHEMICAL, Naugatuck, Connecticut. In Canada, Naugatuck Chemical, Elmira, Ontario.

Other Products of Naugatuck Chemical:

KRALAC molding powders • VIBRIN Polyester resins • PQL chemical and heat resistant baking enamel • SHRINKMASTER process for rendering woolsens shrink-resistant and long-wearing • SPERGON fungicide for seed treating • TUFOR 2-4-D weed killers • PHYGON orchard and row crop spray fungicide • SURFA-SEALZ rubber compound for surfacing highways • LOTOL compound latices, natural and synthetic • DISPERSITE water dispersions of reclaimed rubber and resins • Reclaimed Rubber • Aromatics • Synthetic Rubber • Rubber Chemicals • Raw Latex • Plasticizers

Marvinol
NAUGATUCK CHEMICAL

DIVISION OF UNITED STATES RUBBER COMPANY

injection molding machines by **DE MATTIA**



*-the standard of
MOLDING EFFICIENCY*

The De Mattia Model C-1, illustrated, incorporates the ultimate in design and performance in injection molding machines. Exceptionally heavy tension members, high mold clamping pressure and uniform hydraulic pressure on the entire die face are just a few of the many De Mattia features that increase molding efficiency. Like all De Mattia equipment, Model C-1 is ruggedly constructed to provide long service in continuous use—the kind of service that has made the name De Mattia a standard for reliability throughout the industry.

DE MATTIA HORIZONTAL MODEL C-1 SPECIFICATIONS

Material per Injection — 12 ozs. • Plasticized Material per hour — 130 lbs. • Feed Hopper Capacity — 60 lbs. • Injection Piston Diameter — 2 3/4" • Injection Piston Stroke — 11 1/2" • Hydraulic Injection Cylinder Bore — 13" • Pressure on Material — 22,500 PSI • Mold Closing Pressure — 400 Tons • Max. Mold Size — 18" x 25" • Max. Daylight — 30" • Min. Die Space — 6" • Max. Stroke — 24" • Oil Pump Capacity — 60 GPM @ 1000 PSI, Max. • Motor — 30 HP • Injection Stroke Time, for Filling Mold — 3.0 Secs. • Speed of Injection Piston, Forward — 120" per Min. • Heating Cylinder — 13,000 Watts • Height of Machine, Overall — 72" • Floor Space Required — 172" x 42" • Approx. Weight — 10 Tons.

SEND FOR NEW DE MATTIA CATALOG

It contains complete information and specifications on De Mattia Horizontal and Vertical Molding Machines and De Mattia Scrap Grinders.

MOLDING PRESSES • SCRAP GRINDERS • MOLD MAKING



DE MATTIA MACHINE and TOOL CO.

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Season's Greetings

Our sincere wishes for
A Very Merry Christmas
and a Happy and
Prosperous New Year



NIXON NITRATION WORKS • NIXON • NEW JERSEY

Hand your headaches to "CUBEE"



curing Plastics Problems is his business!

Take advantage of experience the next time you have a problem involving Plastics. Five of the key people here have a total of more than 75 years experience in this business.

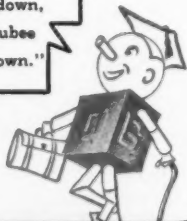
We offer all of the services you need—designing, die-making and molding—all under one roof.

It pays to utilize our "know-how". After all, Plastics is our business. Call "Cubee" the next time you are planning in Plastics.

Q-B Says:

"The next time you are stymied
And a problem's got you down,
Hand your headache to Cubee
He can wipe away that frown."

QUINN-BERRY CORP.
26120 West 12th Street
ERIE, PENNSYLVANIA



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Townsend 8-2577

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Even boiling
in soapy water
fails to injure
vinyl films
plasticized
with

PARAPLEX G-60



Vinyl films, containing MONOPLEX DOS and PARAPLEX G-60, the new polymeric plasticizer, were boiled for 1 hour in a 1-percent soap solution, soaked in water for 23 hours at 60°C., then oven dried for 45 minutes at 85°C.

Result? *The vinyl films lost no plasticizer!*

That's an exacting test. Probably, though, it's no more exacting than the scrubbing and soakings your vinyl products will meet when they become upholstery—or table covers, shower curtains, hose, or dolls.

Your customers want resistance to light and heat, too. And you want the permanence of a polymeric plasticizer—plus the efficiency, low viscosity, and low cost of a monomeric.

Does PARAPLEX G-60 have what you and your customers want? Write—right now—to Dept. MPV-2, and the answer (a 1-quart sample, plus technical notes) will be in your laboratory in a few days.

MONOPLEX, PARAPLEX are trade-marks, Reg. U.S. Pat. Off. and in principal foreign countries.

CHEMICALS



FOR INDUSTRY

ROHM & HAAS COMPANY

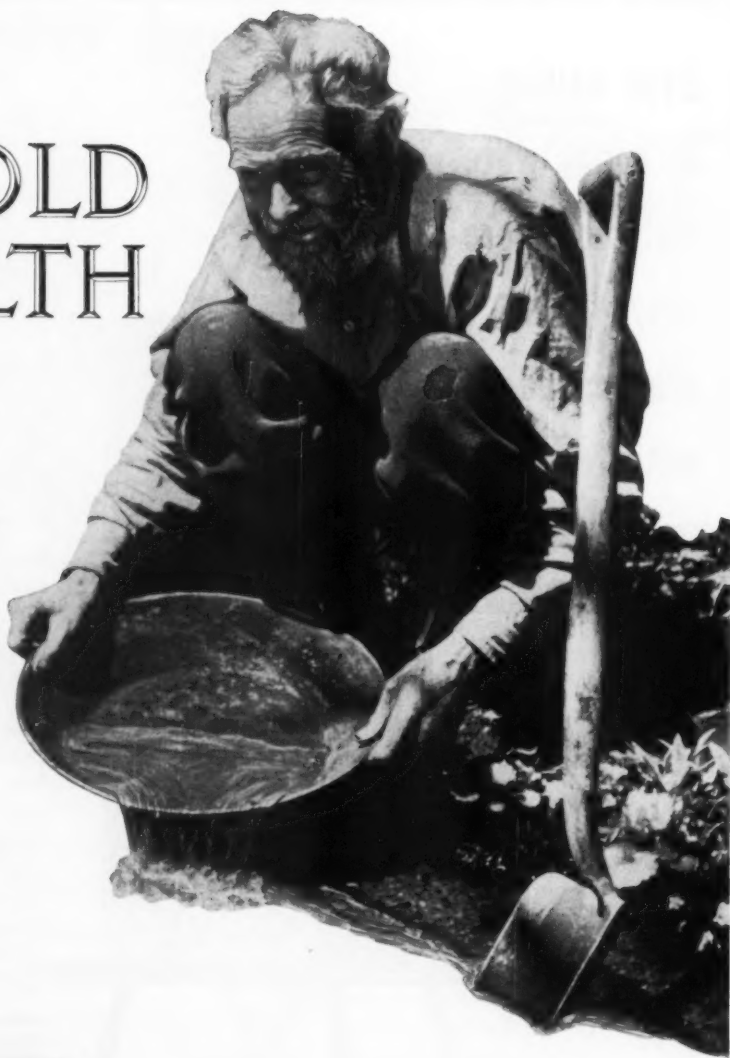
THE RESINOUS PRODUCTS DIVISION

Washington Square Philadelphia 5, Pa.

The Resinous Products Division was formerly The Resinous Products & Chemical Company

UNTOLD WEALTH

... may lie buried
beneath the surface —
needing only
knowledge for its
development.
An idea, too, may
need only the
technical knowledge
to turn it into a
highly salable
product. Columbia
will be happy to
put that knowledge
at your service.



**CUSTOM MOLDERS OF
PLASTIC PRODUCTS AND
SPECIAL PLASTIC PACKAGING**

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ONE OF AMERICA'S LEADING MANUFACTURERS OF SUN GLASSES, COMBS, BRUSHES, TOYS, HOUSEWARES

8

Important Reasons—

why it pays Material Manufacturers,
Compounders and Molders
to insist on

CADMOLITH*

REDS AND YELLOWS

(Cadmium Red and Yellow Lithopone)

FOR PLASTIC MATERIALS

- Soft and Easy to Grind
- Insoluble in all Vehicles
- Alkali and Acid Resistant
- High Heat Resistance
- Non-Fading to Light
- Non-Bleeding
- Opaque
- Wide Range of Shades



*Trade Mark
Registered



SUNOLITH*
Lithopone

ASTROLITH*
Lithopone

ZOPAQUE*
Titanium Dioxide

TITANOLITH*
Titanated Lithopone

Whether you are a material manufacturer, a compounder of new or old materials or a plastic molder or coater . . . you can always depend on Glidden Cadmolith* Colors for the finest results in red and yellow shades. Glidden leadership in research has given these superior colorants properties which not only make your coloring job easier, but produce the finest, most lasting colors in powders and products made from them.

Send for Folder giving complete details, with color chips. Write The Glidden Company, Chemical and Pigment Company Division, Union Commerce Building, Cleveland 14, Ohio.

Where a higher degree of opacity is required, Pure Cadmium Reds are available in the same range of shades as our Cadmolith* Red.



THE GLIDDEN COMPANY
CHEMICAL & PIGMENT COMPANY DIVISION
Baltimore, Maryland • Collinsville, Illinois • Oakland, California



Tupper Seal, air and liquid-tight flexible covers for, and are included in the sets of all Tupperware Containers.



The Tupperware 50 oz. Canister is "standard equipped" with the Tupper Seal, air and liquid-tight flexible Pour All cover.



The Tupper Seal, air and liquid-tight flexible Pour All cover is used on every Tupperware 20 oz. Canister.



The Tupper Seal, air and liquid-tight, Pour All cover is a cover for 46 oz. cans, Tupperware Sauce Dishes and other containers of metal, glass or pottery. Foods easily dispensed without removing entire cover.

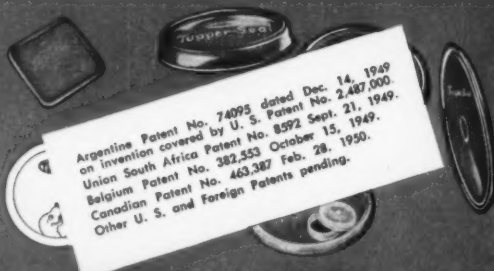


The Tupperware Wonder Bowls are usually fitted with Tupper Seal, air and liquid-tight covers.



Manufacturers of - CONSUMER, INDUSTRIAL, PACKAGING AND SCIENTIFIC PRODUCTS
Farmingtonville, Mass., and Castro, Texas

ADDRESS ALL COMMUNICATIONS TO: Department D



Argentine Patent No. 74095 dated Dec. 14, 1949
on invention covered by U. S. Patent No. 2,487,400
Union South Africa Patent No. 8592 Sept. 21, 1949.
Belgium Patent No. 382,553 October 15, 1949.
Canadian Patent No. 463,387 Feb. 28, 1950.
Other U. S. and Foreign Patents pending.

TUPPER / Seals

air and liquid-tight, flexible covers for Tupperware Tumblers, Canisters, Wonder Bowls, Cereal Bowls and many another container of glass, metal and pottery, the contents of which it is desired to keep fresh and wholesome.

TUPPER /

FORMAL NOTICE!

9th November, 1949

EXCLUSIVE!

U. S. Patent #2,487,400

The Tupper Corporation has attained a position of leadership in this industry by incurring great expense and expending painstaking effort in the development, design, manufacture and exploitation of its many world-known products.

The Tupper Corporation further has anticipated the inevitable attacks to which leadership is subject and has taken measures provided by law to preserve the creative rights to its products, methods and design by patent protection both in the United States and abroad.

Tupper Seals for Tupperware shown in this advertisement are just a few of the forms covered in this manner and are specifically covered by U.S. Patent #2,487,400.

Only the Tupper Corporation, by U.S. Patent #2,487,400 has the right to make, use and vend container closures in connection with any and all types of containers throughout the United States and its territories as covered by the claims of the Patent.

Tupper Corporation will protect, according to law, the exclusive rights above granted

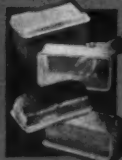
TUPPER CORPORATION

TUPPER CORPORATION

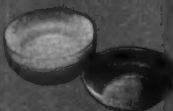


There's a Tupper Seal, air and liquid-tight flexible cover for Tupperware 2, 5, 8 and 12 1/2 oz. Tumblers too, and the Tupper Seal, covers many other containers of metal, glass and crockery.

The Tupper Seal, air and liquid-tight flexible Pour Top cover, specially designed as a dispensing cover for specified diameters of containers holding foods such as syrups, salad dressings, catsup.



The cover of the Tupperware Bread Server which serves as a bread tray, also is designed to give similar results as Tupper Seal, air and liquid-tight Flexible covers. Keeps contents fresh as no other such container.



When equipped with Tupper Seal, air and liquid-tight, flexible cover, Tupperware Cereal Bowls serve many another purpose.



The Tupper Seal, air and liquid-tight flexible cover made for Tupperware 8 oz. Tumblers also fits and is sold with all Tupperware Funnel as a bowl when funnels are used as storage containers.

Let's ALL get behind
the plastics industry's
labeling program

The Society of The Plastics Industry has taken an important step forward to win increased customer and retail acceptance of plastics . . . with an informative labeling program. A program to educate consumers, instill in them full confidence in plastics.

An informative label not only guides Mrs. Consumer in her purchases, but, at home, gives her a complete understanding of what to expect from the plastics product she bought . . . and confidence in working with it.

Retailers say a factual label is their best salesman of plastics. It keeps them sold. And brings customers back again and again. Remember, as you help retailers sell, you boost your own sales . . . and profits.

In short, good labeling is good selling . . . for plastics generally, and your products in particular.

You'll want a copy of the S.P.I.'s new booklet, "How to Label Plastics Products...for Profit." Write to the Society of The Plastics Industry, Inc., 295 Madison Ave., New York 17; or send the coupon below to Monsanto, and we'll arrange for a copy to be sent to you.

In addition, Monsanto will be happy to work with you if you'd like help in starting your informative labeling program. Just check the coupon.



SERVING INDUSTRY . . . WHICH SERVES MANKIND



MONSANTO CHEMICAL COMPANY, Plastics Division,
Dept. MPLP 36, Springfield 2, Mass.

- ☐ Please arrange to send me the S.P.I. booklet, "How to Label Plastics Products . . . for Profit."
☐ I would like help in starting my informative labeling program.

Name & Title _____

Company _____

Address _____

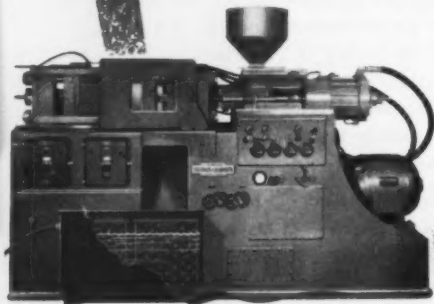
City, Zone, State _____

How to offset the polystyrene shortage

1. Production via multiple-cavity molds has a special drawback in times of material shortage. The amount of material in sprues and runners **ON MANY JOBS** is a critical disadvantage.
2. A single-cavity, mold operating at "Hot Molding" speed on a Fellows-Leominster 3 oz. machine, may yield just as great production... but with a much smaller sprue, and perhaps no runner at all.
3. There may be a 20 times advantage in the *amount* of material to be granulated... the granulating time proportionately less.
4. The higher the percentage of virgin material the surer you are of the quality of your output:
 - (a) *less risk of color contamination*
 - (b) *less chance for inclusion of foreign material*
5. Further, molding material inventories need not be so large.
6. And one single operator can tend up to 3 automatic Fellows-Leominster machines. They work so fast that water quenching is used to harden the pieces as they are ejected.

It is very worth your while, in the face of the material shortages now looming up, to investigate the production-rate possibilities of the 3 oz. F-L Molding Machines on your jobs in hand, or in prospect.

Wire, write or phone the nearest Sales Office.

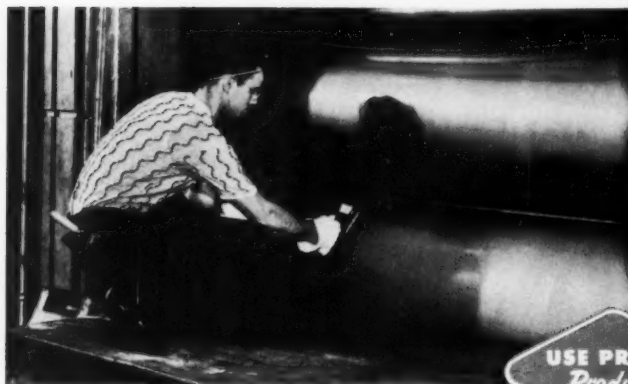


Fellows
LEOMINSTER
injection molding equipment

THE FELLOWS GEAR SHAPER CO., Plastics Machine Div., Head Office & Export Dept., Springfield, Vt. Branch Offices: 616 Fisher Bldg., Detroit 2, 840 West Town Office Bldg., Chicago 12 • 2306 Empire State Bldg., New York 1 • New England Distributor: Leominster Tool Co., Leominster, Mass.

Can you spot the difference?

PLIOVIC in "dead white" vinyl sheeting. Sample at bottom right was processed completely three times—middle sample twice—top right sample only once. Note almost-complete lack of color difference, showing excellent heat stability.



USE PROVED
Products

One of these samples is white sheeting made with PLIOVIC after only one run through normal processing technique. The other two samples show the same sheeting after one and two complete reprocessings. Yet there is practically no difference in color!

This outstanding heat stability, together with ease of processing at lower temperature, lower plasticizer requirements and its ability to be loaded with little effect on its excellent physical properties, combine to make PLIOVIC well worth your evaluation.

The Goodyear-developed PLIOVIC resins are available in three forms — PLIOVIC A and PLIOVIC AR for use in calendered and extruded items, and PLIOVIC AO for organosols.

Write today for samples for evaluation and for full details on PLIOVIC—Goodyear's high molecular weight, high vinyl-content resins—to:

GOODYEAR, CHEMICAL DIVISION
AKRON 16, OHIO

GOOD YEAR

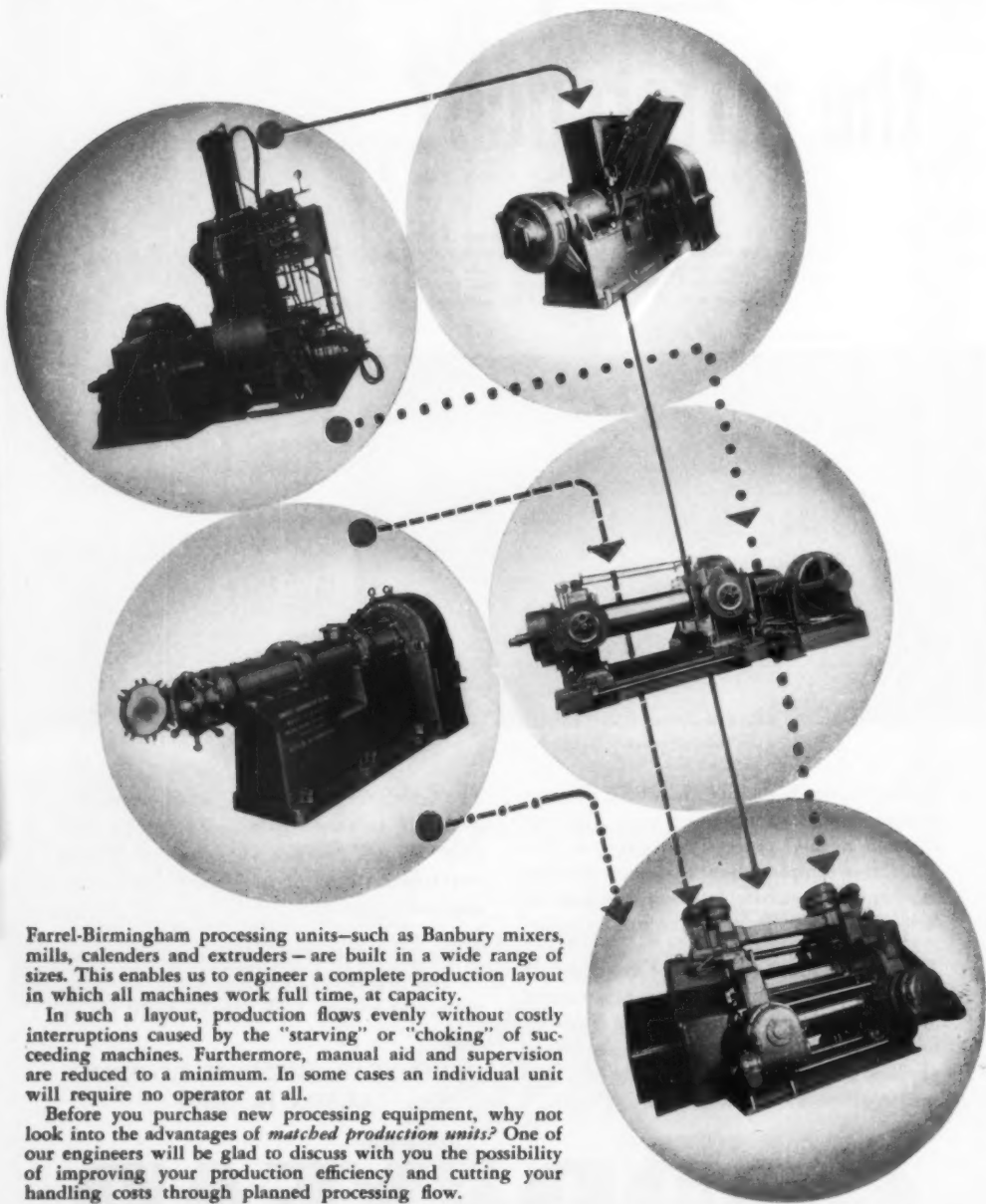
We think you'll like "THE GREATEST STORY EVER TOLD" — Every Sunday — ABC Network

Plivio—T.M. The Goodyear Tire & Rubber Company, Akron, Ohio

December • 1950

35

These Units Can All Be MATCHED IN CAPACITY FOR FREE-FLOWING PRODUCTION



Farrel-Birmingham processing units—such as Banbury mixers, mills, calenders and extruders—are built in a wide range of sizes. This enables us to engineer a complete production layout in which all machines work full time, at capacity.

In such a layout, production flows evenly without costly interruptions caused by the "starving" or "choking" of succeeding machines. Furthermore, manual aid and supervision are reduced to a minimum. In some cases an individual unit will require no operator at all.

Before you purchase new processing equipment, why not look into the advantages of *matched production units*? One of our engineers will be glad to discuss with you the possibility of improving your production efficiency and cutting your handling costs through planned processing flow.

FARREL-BIRMINGHAM COMPANY, INC. • ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.

Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston

FB-367

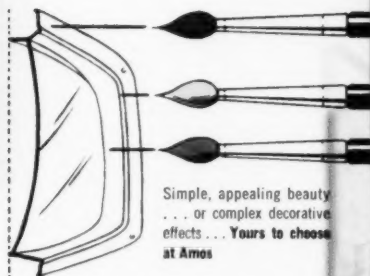
Farrel-Birmingham®



42-OUNCE PIECE

Producing television windows and frames for Crosley, Admiral, Philco and R.C.A.

Crosley 17"
"family theatre"
TV lens.



Simple, appealing beauty
... or complex decorative
effects... Yours to choose
at Amos

Amos
MOLDED PLASTICS

3 color finishing

Injection Molding Specialists—4 to 300-ounce
Machine Capacity

Beautiful, sparkling, fadeless 3-color finishing teams up with ingenious design and molding perfection to produce:

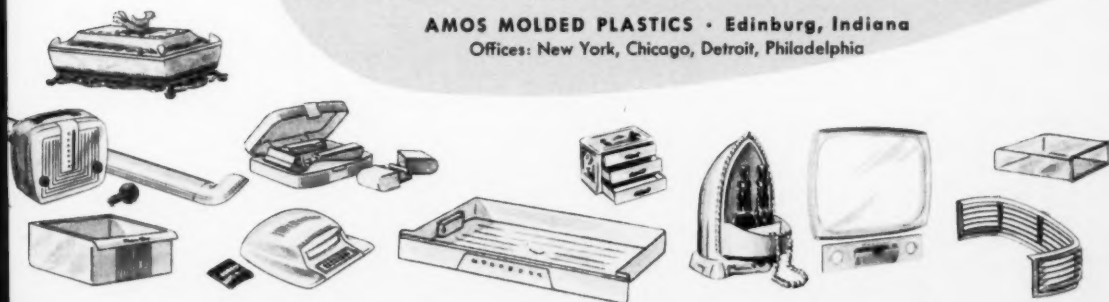
Crosley's distinctive 17" wide-angle "family theatre" TV lens—with "proscenium arch" framing and slanted contour to reduce reflection.

(A far cry from the first injection lens pioneered for the industry by Amos—a 7-incher in early 1948.)

Amos' New **Larger** Equip-
ment Molds **Bigger** Parts
For Every Industry

Scores of customers in many industries depend upon AMOS to do the complete job right—DESIGN, ENGINEER, TOOL, MOLD and FINISH—all under one roof in one of the most modern plants in the industry. Contact AMOS... Today!

AMOS MOLDED PLASTICS • Edinburg, Indiana
Offices: New York, Chicago, Detroit, Philadelphia

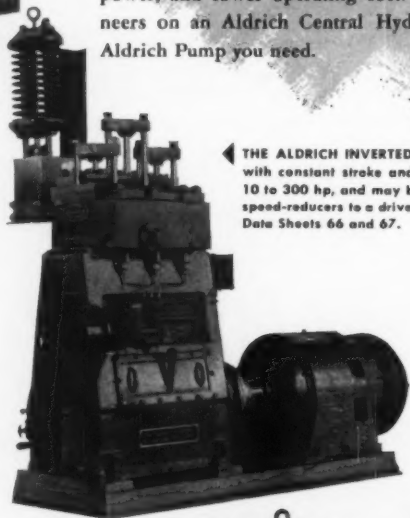




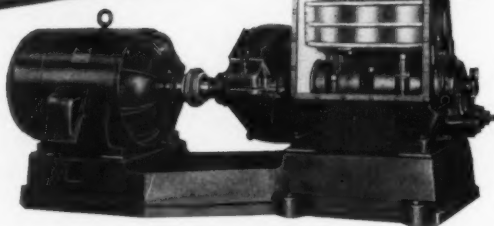
▲ **THE ALDRICH-GROFF "POWER-SAVR" CONTROLLABLE CAPACITY PUMP...** supplies only that hydraulic power actually needed. Delivery is almost directly proportional to demand. An automatic stroke regulating mechanism compensates for variation in power needed and eliminates start-stop operation. A relatively small accumulator is required. Request Data Sheet 65.



▲ **THE ALDRICH-LYTTLE AIR POWERED PUMP...** operates on available plant air pressure (not over 100 lbs.) and delivers up to 20,000 lbs. pressure.



▲ **THE ALDRICH INVERTED VERTICAL TRIPLEX PUMP...** with constant stroke and constant speed, ranges from 10 to 300 hp, and may be coupled directly or through speed-reducers to a driver located on the floor. Request Data Sheets 66 and 67.



▶ **THE 5" STROKE DIRECT FLOW PUMP...** new to the Aldrich line, this unit has a through-flow, close clearance design and a sectionalized construction which features extreme simplicity and maintenance economies. Drive can be by electric motor, turbine, steam or internal combustion engine. Request Data Sheet 64.

Representatives: Birmingham • Bolivar, N. Y.
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Seattle • Spokane, Wash. • Syracuse • Tulsa

THE  **PUMP COMPANY**

6 GORDON STREET, ALLENTOWN, PENNSYLVANIA
Export Dept: 751 Drexel Building, Phila. 6, Pa.

All Aldrich Pumps Have **STAYING POWER**

1

PUMP FOR ALL PRESSES

Centralize and Save... with an Aldrich Central Hydraulic System

For operation of hydraulic presses—a single, concentrated source of hydraulic power is good engineering.

One Aldrich Pump can serve all your presses and reduce costs through: minimum investment for equipment, less maintenance and repair, more efficient production of power, and lower operating cost. Check with our engineers on an Aldrich Central Hydraulic System and the Aldrich Pump you need.



Display bust, molded for
Jewels by Bogoff, Chicago

Putting New Sparkle into Jewelry Sales

Here is glamour, sleek beguiling glamour that really helps to sell these exclusive jewels by Bogoff. Yet it's glamour mixed with sound engineering.

For this skillfully molded plastic display, while vastly *more attractive*, actually *costs less* than the one previously used. Lightweight and compact, it also sharply reduces packing and shipping costs.

Let us look at your product in the same light—with a view toward product improvement at reasonable cost. We'll gladly send a representative without obligation.



Write on your letterhead for the new Injection Molded and Extruded Plastics Catalog. Or, for detailed information about ~~CHLORO-POLYMER~~ piping, tubing and fittings, write for circulars containing data and illustrations.

•Trademark Registered

ELMER E. MILLS CORPORATION

INJECTION MOLDERS and EXTRUDERS of: Tenite, Lumarith, Plastacele, Fibestos, Lucite, Nylon, Plexiglas, Polystyrene, Styron, Ialain, Vinylite, Geon, Plexene, Polyethylene, Cerex, Fortical, ~~CHLORO-POLYMER~~, Saran, and other Thermoplastic Materials.

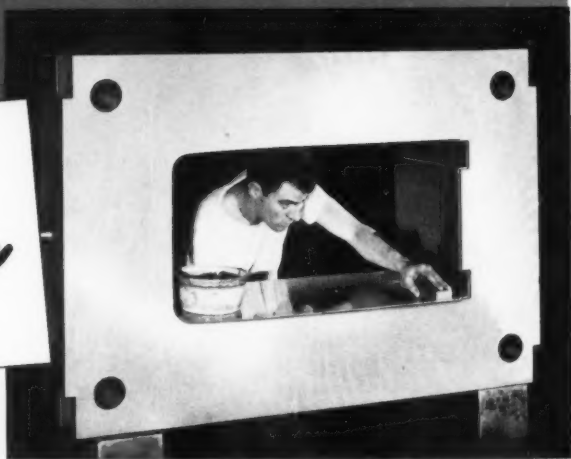
2930 NORTH ASHLAND AVENUE • CHICAGO 13, ILLINOIS

IT'S AN MPc
TRADITION...

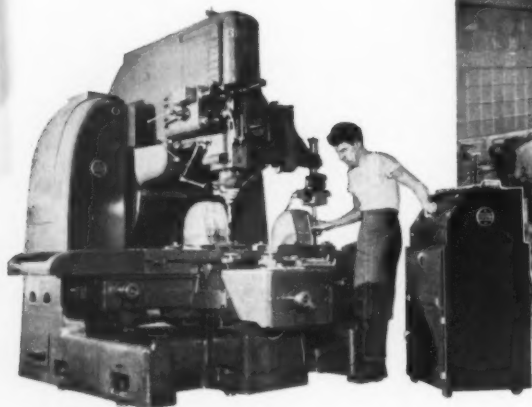
*Never
say "Die"*

WHEN SPEAKING OF A PLASTIC MOLD

In piling the advance to ever-larger plastic castings, MPc engineers encountered many a challenging problem in designing, tooling and heat-treating molds of unprecedented size and weight. Successfully processing these huge blocks of steel called for inventive imagination...backed by the facilities of a tool room equipped with the most advanced machines and staffed by highly skilled craftsmen. Today at MPc, unmatched facilities and an unparalleled fund of experience are yours to use. Submit your plastics product or problem to MOLDED PRODUCTS CORPORATION, 4535 W. Harrison St., Chicago 24, Ill.



Molds that weigh thousands of pounds are machined to extremely close tolerances.



DUPLICATING MACHINE
with "electrical brain"

This 15 C Gorton Electrical Duplicating Machine cuts intricate steel or nonferrous molds by following a wood or plaster model...much faster, more economical and more versatile than ordinary milling. It will take any size cavity up to 32" x 42".



General view of MPc tool room where huge blocks of tool steel are machined to micrometric accuracy.

PLASTICS DIVISION
MOLDED MPc PRODUCTS
CORPORATION

Now

LOOMING LARGER

in your
operations

plastic SCRAP is not WASTE!

plastic
SCRAP
is not
WASTE!

plastic
SCRAP
is not
WASTE!

plastic
SCRAP
is not
WASTE!

plastic
SCRAP
is not
WASTE!

headquarters



save **MONEY!** save **RESOURCES!**

Gering will buy your thermoplastic scrap, obsolete molding powders, rejects in any form . . . will reclaim and rejuvenate this valuable "scrap" into perfectly good molding powders . . . will sell you good reconditioned molding powders: Polystyrene, Cellulose Acetate, Ethyl Cellulose, Polyethylene, Butyrate, Vinyl, Acrylic.

*Our Technical Service
Department is at your
service at all times.*

GERING

Products Inc.

KENILWORTH, N. J.

NEW From Du Pont...

**A POWERFUL
SOLVENT to help you
IMPROVE your VINYL
RESIN COATINGS
and ADHESIVES**

TETRAHYDROFURAN

NOW AVAILABLE IN COMMERCIAL QUANTITIES

It's the ideal solvent for high molecular weight polyvinyl chloride, vinylidene chloride copolymers, and other difficultly soluble organic materials. With Tetrahydrofuran you can get solutions of comparatively high solids content at practical working viscosities. Tetrahydrofuran is an excellent solvent for many resins used in the production of clear, light-colored coating compositions.

EFFECTIVE ADHESIVE COMPOSITIONS can be formulated with Tetrahydrofuran. Typical compositions include a 10 per cent solution of polyvinylidene chloride in Tetrahydrofuran to seal polyvinylidene chloride sheets

and bags. A 10 per cent solution of polyvinyl chloride in Tetrahydrofuran is an effective adhesive for polyvinyl chloride sheets.

PHYSICAL PROPERTIES

Appearance.....	Colorless, mobile liquid
Odor.....	Ether-like
Molecular Weight.....	72.10
Boiling Range @ 760 mm.....	65-67°C.
Specific Gravity, 20/4.....	0.887
Index of Refraction, N _D 20.....	1.407
Flash Point.....	-17°C.
Vapor Pressure @ 25°C.....	176 mm.
45°C.....	385 mm.
65°C.....	760 mm.
Solubility.....	Miscible with water and most common organic solvents.

TETRAHYDROFURAN WATER-MIXTURES have unusual solvent power. The mixture is a better solvent for cellulose acetate than Tetrahydrofuran alone.

SOLVENT POWER of less active solvents can be improved by addition of Tetrahydrofuran. For example, clear films can be cast from 10 to 15 per cent solutions of high molecular weight polyvinyl chloride in a 65/35 mixture of Tetrahydrofuran with methyl ethyl ketone.

**DU PONT
ELECTROCHEMICALS**



BETTER THINGS FOR BETTER LIVING
... THROUGH CHEMISTRY

A REQUEST

on your company letterhead will bring technical bulletins, price information, and samples if desired. Just write to E. I. du Pont de Nemours & Co. (Inc.), Electrochemicals Department, Field Research Section, Wilmington 98, Delaware.

"no more GAMBLING on tool steel selection"



[1/2 actual size; Selector is in 3 colors]

Here's how it works:

To use the Selector, all you need know is the characteristics that come with the job: type and condition of material to be worked, the number of pieces to be produced, the method of working, and the condition of the equipment to be used.

FOUR STEPS—and you've got the right answer!

1. Move arrow to major class covering application
2. Select sub-group which best fits application
3. Note major tool characteristics (under arrow) and other characteristics in cut-outs for each grade in sub-group
4. Select tool steel indicated

That's all there is to it!

Here's an example:

Application—Deep drawing die for steel

Major Class—Metal Forming—Cold

Sub-Group—Special Purpose

Tool Characteristics—Wear Resistance

Tool Steel—A150

One turn of the dial does it!

And you're sure you're right!!

Since the first announcement, hundreds of tool steel users have received their CRUCIBLE TOOL STEEL SELECTORS. The comments received indicate that this handy method of picking the right tool steel right from the start is going over big.

"Handiest selector I've ever seen"

"No more gambling on tool steel selection"

"You're right, the application should dictate the choice of the tool steel" . . . and many, many more favorable comments.

You'll want your CRUCIBLE TOOL STEEL SELECTOR. It uses the only logical method of tool steel selection—begin with the application to pick the right steel! And the answer you get with one turn of the Selector dial will prove satisfactory in every case, for the CRUCIBLE TOOL STEEL SELECTOR covers 22 tool steels which fit 98% of all Tool Steel applications. ALL the tool steels on the Selector are in Warehouse Stock . . . that means when you get the answer, you can get the steel . . . fast!

Write for your Selector today! We want you to have it, because we know you've never seen anything that approaches your tool steel problems so simply and logically. Just fill out the coupon and mail. Act now! CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.

Crucible Steel Company of America
Dept. MO, Chrysler Building
New York 17, N. Y.

Gentlemen:

Sure! I want my CRUCIBLE TOOL STEEL SELECTOR!

Name _____ Title _____

Company _____

Street _____

City _____ State _____

CRUCIBLE

first name in special purpose steels

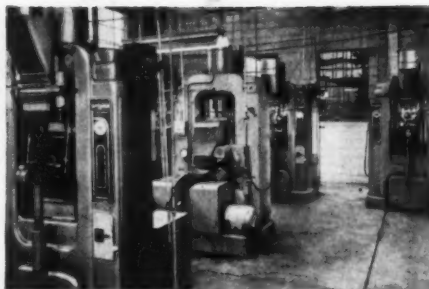
TOOL STEELS

fifty years of Fine steelmaking

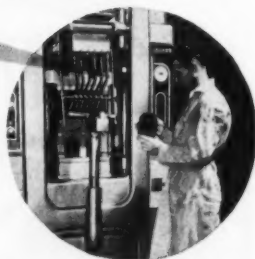
Branch Offices and Warehouses: ATLANTA • BALTIMORE • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DENVER • DETROIT • HOUSTON, TEXAS • INDIANAPOLIS • LOS ANGELES • MILWAUKEE • NEWARK • NEW HAVEN • NEW YORK • PHILADELPHIA • PITTSBURGH • PROVIDENCE • ROCKFORD • SAN FRANCISCO • SEATTLE • SPRINGFIELD, MASS. • ST. LOUIS • SYRACUSE • TORONTO, ONT. • WASHINGTON, D. C.

December • 1950

Automatic Molding cuts costs for Electric Steam Radiator



These fully automatic molding presses have operated 24 hours a day ever since they were installed. The only work required is



filling hoppers and removing finished parts.

New production figures of the Electresteam vaporizer and the Baby Chef Jr. bottle warmer are gratifying to both executive and shop levels of Electric Steam Radiator Corporation, Paris, Ky.



In the re-designed form—plastics replacing porcelain—the product is generally superior: more durable, lighter, easier to handle, and with less external heat loss.



If you want to know what automatic molding can save you in production costs, send parts or blueprints for a free analysis and report by Stokes engineers.

STOKES MAKES Automatic and Semi-Automatic Molding Presses, Plunger Presses, Closure Presses, Preforming Presses, Industrial Tableting and Powder Metal Presses, Vacuum and Special Processing Equipment, Water Still and Special Machinery.

STOKES

F. J. STOKES MACHINE COMPANY, 5934 Tabor Road, Philadelphia 26, PA.

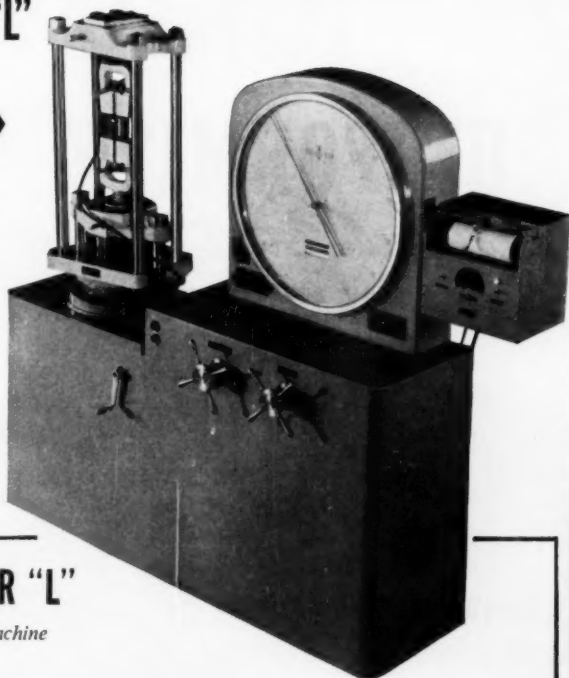
Get the Facts about...

The **NEW** OLSEN SUPER "L" TESTING MACHINE

*the most versatile, low cost
testing machine available today*

Designed and Proved for Fast, Accurate and Convenient Operation on:

- ★ Routine laboratory testing
- ★ Specimens of fixed types and dimensions
- ★ Quality and production control
- ★ College and trade school instruction



Compare the OLSEN SUPER "L"

*with any other type of Universal Testing Machine
—Regardless of Cost.—*

- ★ Spread of testing ranges
- ★ Ease of changing ranges
- ★ Simplicity of inserting specimens
- ★ Versatility of control
- ★ Compact rugged construction
- ★ Fool-proof indicating system
- ★ Maintenance-free operation
- ★ Dependable accuracy
- ★ Low Cost

Learn about the Amazing Performance of the Olsen Super "L" with the

NEW Selecf~~o~~range INDICATING SYSTEM
with ATCOTRAN UNIT

that makes possible a 50 to 1 spread of testing ranges on one 28" dial. Write today for Bulletin 40.

TINIUS  OLSEN

Testing & Balancing Machines

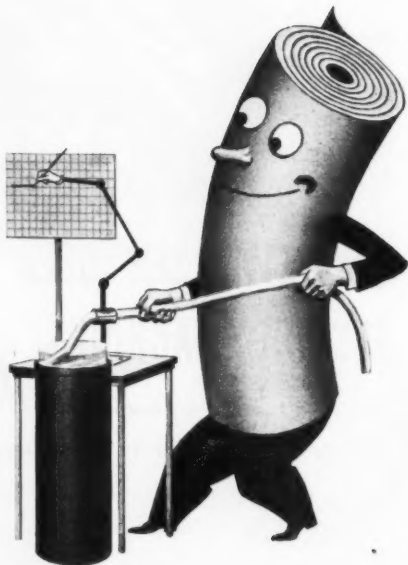
TINIUS OLSEN
TESTING MACHINE CO.
2050 Easton Rd., Willow Grove, Pa.

CHECKING EVENNESS OF SLIVER WITH LINEAR REGULARITY TESTER. One of a series of laboratory controls throughout production to assure fabric uniformity in all Mt. Vernon-Woodberry products.



UNIFORMITY

Makes the Big Difference
In LAMINATION Fabrics



**MT. VERNON
EXTRA**

Gives You
Greater Fabric Uniformity

The rigid laboratory checks which control the production of Mt. Vernon Extra fabrics assure the high degree of uniformity you need for dependable lamination.

AT YOUR SERVICE

Mt. Vernon-Woodberry's staff of textile engineers is available on request to help you with your problems in development or application of industrial fabrics.



Mt. Vernon-Woodberry Mills

Branch Offices: Chicago • Atlanta • Baltimore • Boston • Los Angeles • Akron

TURNER HALSEY

COMPANY

Selling Agents

40 WORTH ST. NEW YORK

Magnet in a Major Market



Toys made with cellulose acetate are bright and gay, rich in color, and charming in their lifelike realism. Children and parents alike find them irresistible.

There's more, though, to the story of the popularity of acetate playthings than mere good looks and eye appeal. Both retailers and customers have learned that selecting acetate toys is their one best assurance of obtaining quality . . . quality, which like acetate's color, is through and through.

In store windows, and on counters everywhere, the finest plastic toys are acetate.

HERCULES POWDER COMPANY 916 Market St., Wilmington, Delaware

COLORFUL
LIGHTWEIGHT
DURABLE
STRONG
ECONOMICAL
SAFE

HERCULES

Cellulosic Plastics



CP50-8



CREATIVE CUSTOM MOLDING

The above illustration is an example of CRUVER'S versatility in custom molding.

CRUVER supplies the three plastic units for this attractive cash register illuminated sign. The sign was designed by Anheuser-Busch and is produced by Raymond M. Price and Associates of Chesterton, Indiana.

CRUVER

MANUFACTURING CO.

2460 W. JACKSON BLVD., CHICAGO 12, ILL.

BRANCH OFFICES

DETROIT

MINNEAPOLIS

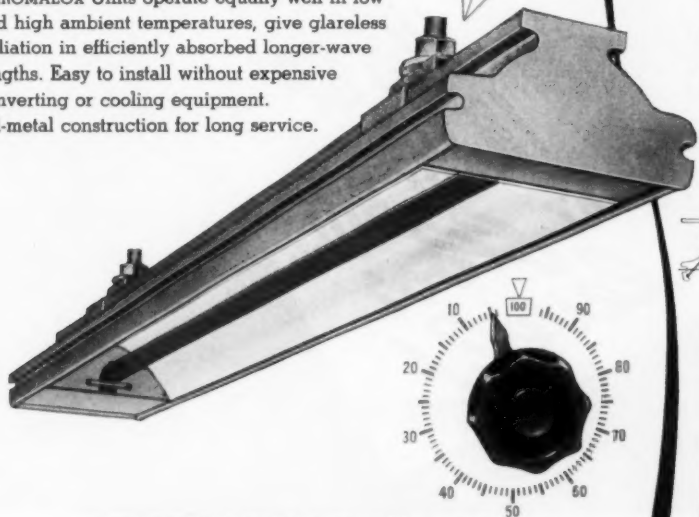
NEW YORK

CLEVELAND

ST. LOUIS

Uniform, EXACT infrared heat at the turn of a dial

You can "dial" the exact uniform heat you need to fit the job in infrared drying, baking, preheating, curing, dehydrating and similar applications when you use CHROMALOX Electric Radiant Heaters. Compact CHROMALOX Units operate equally well in low and high ambient temperatures, give glareless radiation in efficiently absorbed longer-wave lengths. Easy to install without expensive converting or cooling equipment. All-metal construction for long service.



CHROMALOX Radiant Heaters

trouble-free All-metal unit withstands shock, vibration, dust, blows and rough handling. Not affected by splashed liquids; nothing to shatter.

flexible heat Precise temperatures at the turn of a dial, easily regulated for changed working requirements. Ovens can be zoned for stepped-down heat.

color-blind Chromalox Radiant Heat ignores color variations; longer-wave length infrared is absorbed equally by all colors, textures, surfaces.

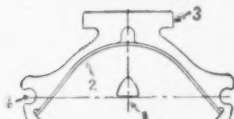
uniform heating Light, dark or multicolored work may be processed simultaneously. Proper heater positioning assures an even blanket of heat without hot-spots.

CHROMALOX

Electric heat for modern industry

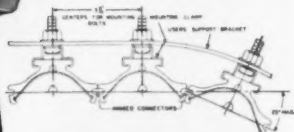
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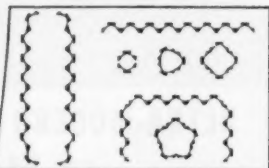
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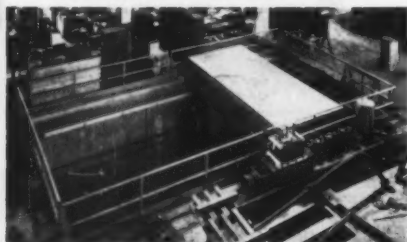
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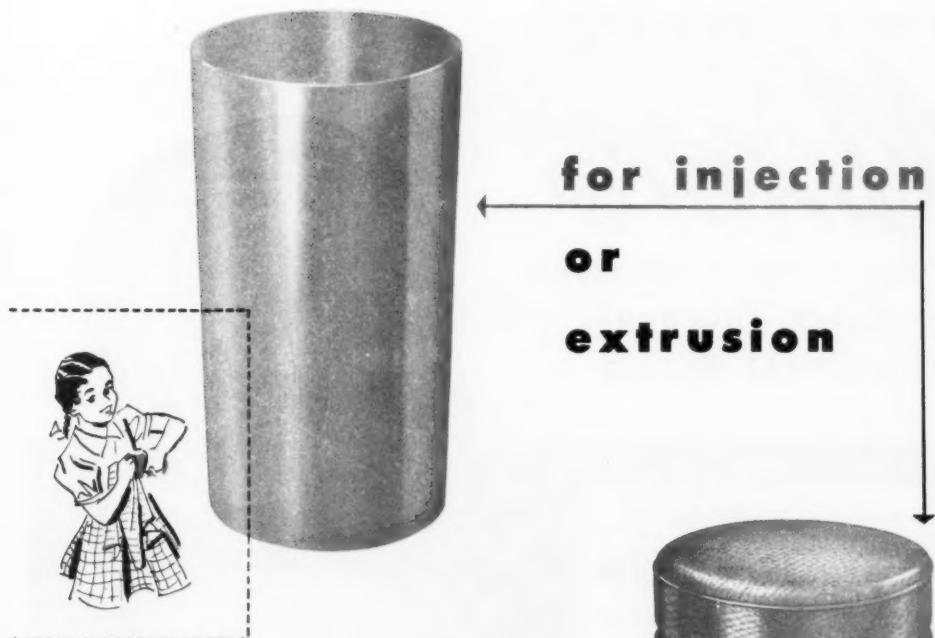
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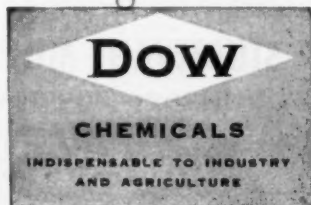
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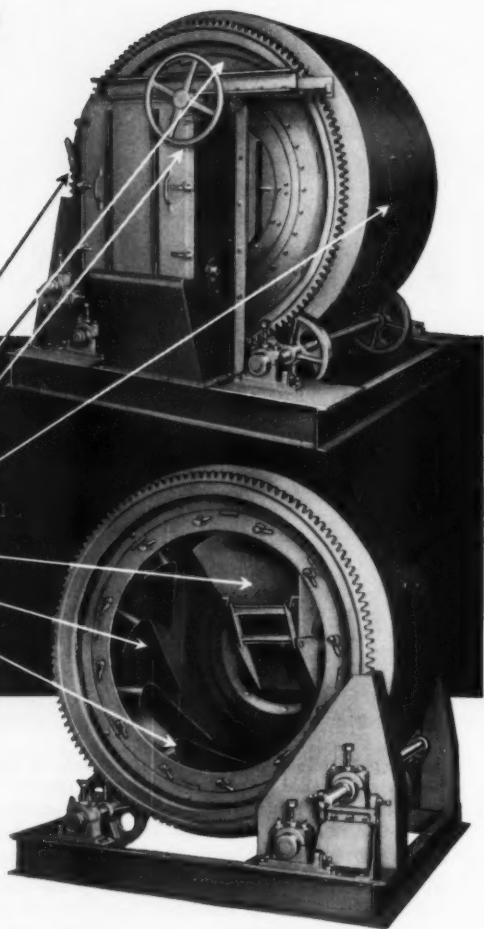
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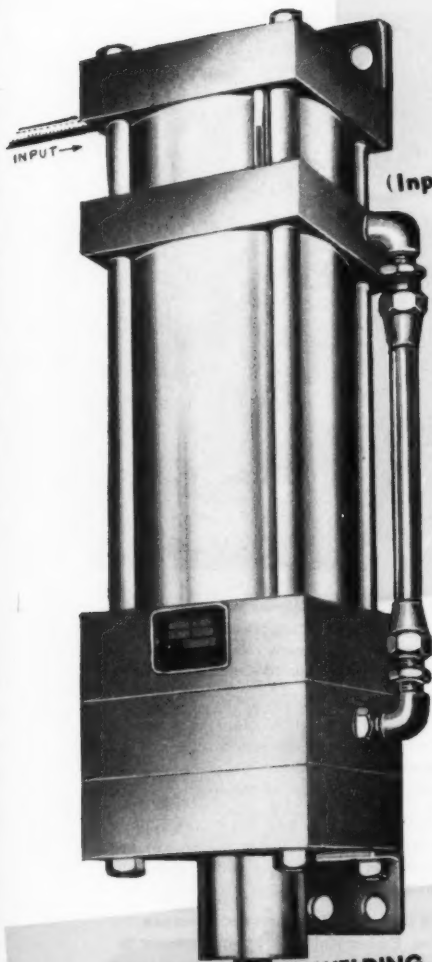
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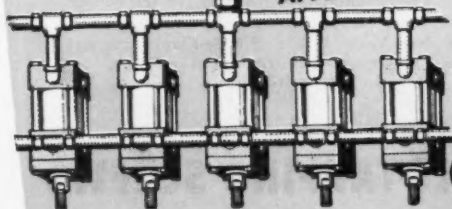
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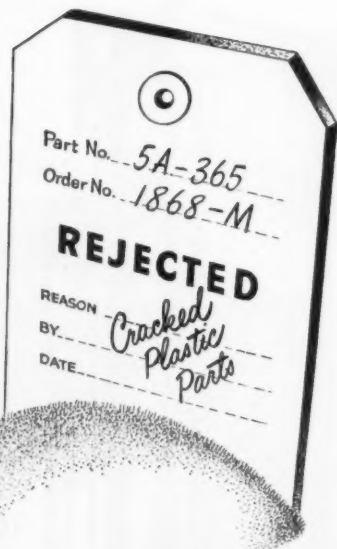
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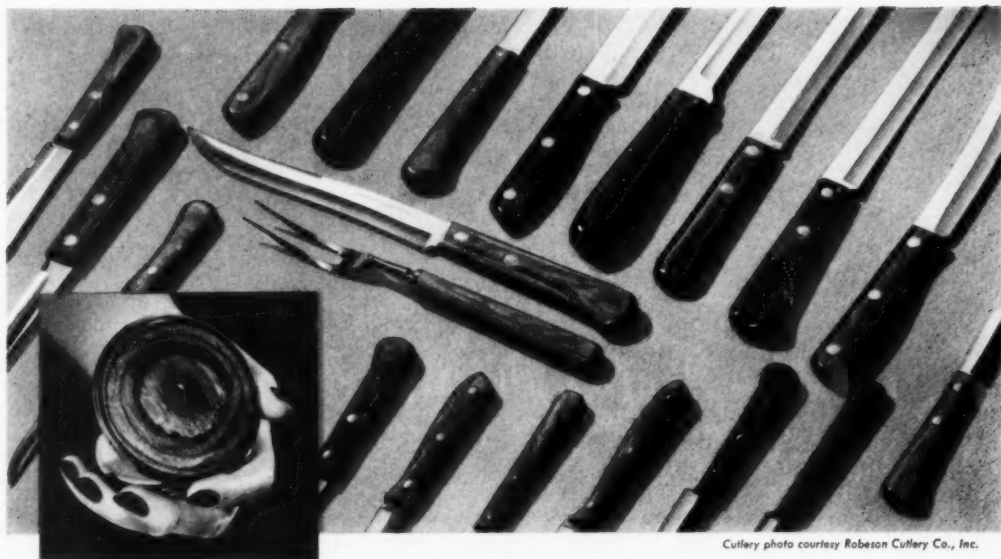
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Cutlery photo courtesy Robeson Cutlery Co., Inc.

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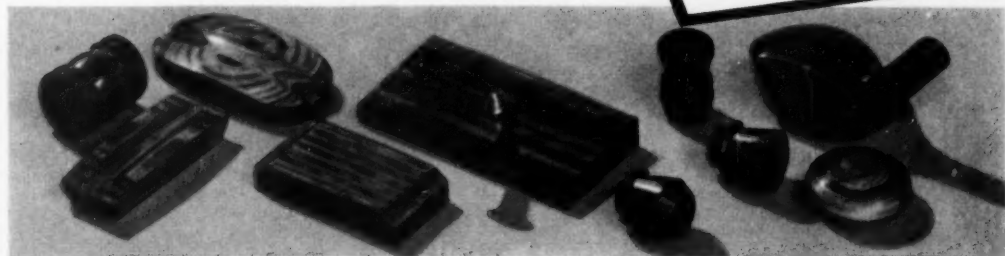
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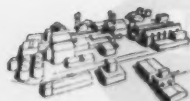
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Jobs CAST PLASTICS *Can Do*

TO JUDGE by the amount of publicity which cast products get in comparison to those made by molding or extrusion, one might guess that cast plastics are on the way out. But nothing could be further from the truth. Other methods, more suited economically to mass production, have cut into the market for cast materials in some fields; but cast plastics have been holding on to most of their markets and opening up new fields to make up for those few they have lost. And now the comparative availability of some casting materials in this era of shortages may cause some applications to turn to cast plastics instead of to other materials. This will be true not only on short

run jobs, where casting is often economical, but on long runs of complicated industrial parts.

Phenolics

The best known of the cast plastics are the phenolics. The plural is proper in this case because there are actually two different "cast phenolics": cast phenolic resin, and phenolic casting resin. The difference between the two is simple. Cast phenolic resin is cast by the material manufacturer and is sold to fabricators in the form of sheet, rod, tube, or special shapes. Casting resin is sold in liquid form by the material manufacturer and is cast by the purchaser.

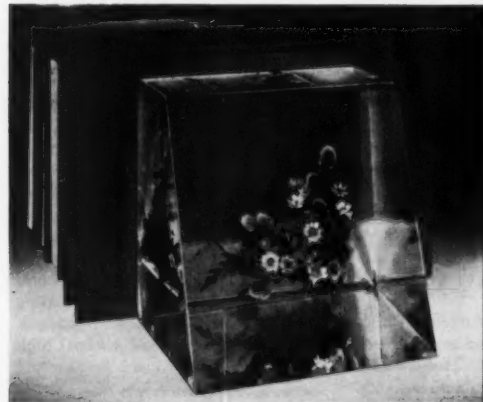
Cast phenolic resin is made by

Catalin Corp. of America, New York, N. Y., and by The Marblette Corp., Long Island City, N. Y. The single application of cast phenolic resin which accounts for the most volume is cutlery handles. Although cast phenolic has lost ground to injection molding as far as small handles are concerned, it has offset these losses by its increased use for larger handles, such as simulated stag handles for carving sets.

Another important application is decorative buttons. Cast phenolic did best in this field during World War II when other materials were short and metal buttons, in particular, were impossible to get. As a result, button manufacturers have been

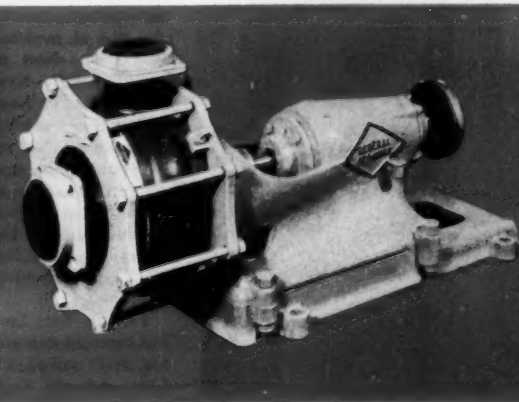
Floral design is embedded in a block of cast acrylic to make an attractive book end. Other decorative accessories are made to match

Courtesy Vernon-Benshoff Co.



Pump for handling highly corrosive chemicals has volute, impeller, and gland cast from modified phenolic. Parts are strong and acid-resistant

Courtesy Pennsylvania Salt Mfg. Co.





Courtesy Purdue University

Gears fabricated from cast phenolic are used for photoelastic stress analysis

Plate Glass Co., Pittsburgh, Pa.; and Marco Chemicals, Inc., Sewaren, N.J. The main application for such resins is for potting electrical circuits for electronic equipment, small radios, and hearing aids. This type of application will be discussed in a separate article in an early issue of MODERN PLASTICS.

With the same limitations mentioned above in regard to phenolic casting resins, the polyesters are used for casting industrial parts for experimental runs or other short runs. Some such parts are shown in the photograph (pp. 60 and 61) of castings produced by Applied Resins.

Another example of such a casting is the tuning rod for radar equipment cast of Marco resin by LeConte Plastics Co., Inc., Babylon, N. Y., for Airborne Instruments Laboratory,

Mineola, N. Y. The tuning rod was produced by placing the metal core in an aluminum tube with a centering disk on each end and then pouring in the resin. A tight seal between the plastic and the metal was necessary, and could not be economically produced in any other manner in the quantities required.

A third field of application for cast polyesters is embeddings. Pike's Peak Plastics, Inc., Colorado Springs, Colo., is using Selectron for casting tie chain pendants with trout flies embedded in them.

Because of their color range and the ease with which they can be cast to intricate shape, there have been some attempts to use polyesters to produce statuettes and other giftware items.² To date, however, this application has met with only limited success.

Allyl (CR-39)

One of the most interesting of the cast materials insofar as recent progress is concerned is allyl diglycol carbonate or, as it is better known, CR-39. This material, made by Columbia Chemical Div., Pittsburgh Plate Glass Co., can be used to cast objects with optical clarity, and with abrasion resistance and heat resistance unobtainable in other clear plastics.

Ophthalmic lens blanks are being cast to power with CR-39 by The Amorlite Lens Co., Inc., Pasadena, Calif., and by Optical Plastics Corp., Stamford, Conn. The plastic lenses are lighter than glass, are virtually

unbreakable, will not fog up, and are sufficiently abrasion resistant to last at least until the lenses need changing because of a change in prescription. The blanks can be ground to shape by oculists in the same manner and with the same equipment used for glass lenses.

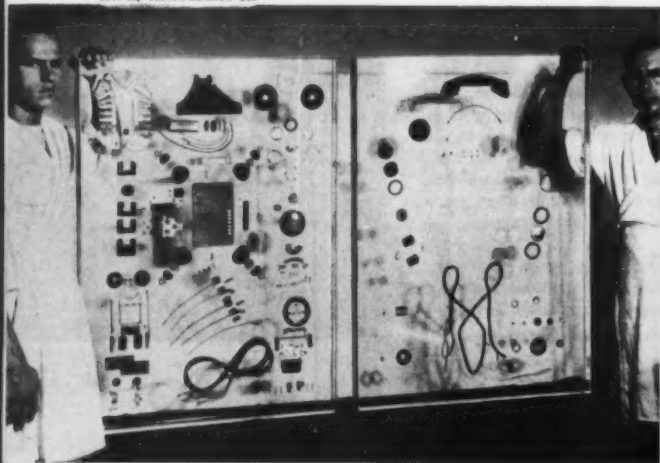
The lenses made by Optical Plastics are distributed by Univis Lens Co., Dayton, Ohio. Optical Plastics also casts CR-39 sunglass lenses and safety goggle lenses for Apex Optical Corp., Providence, R. I.

Because of its optical clarity, CR-39 is also being used to cast Schmidt correction lenses for projection-type television receivers, optical wedges, photographic filters, and instrument windows. Cast Optics Corp., Riverside, Conn., which is casting these products, reports that CR-39 has been adopted for windows on 85% of the instruments made by Sperry Gyroscope Co. The company also reports that CR-39 is the only material considered completely acceptable for military watch crystals. Electro Seal Watch Crystal Co., New York, N. Y., is distributing watch crystals made of 0.040, 0.050, or $\frac{1}{16}$ -in. thick CR-39 sheet produced by Cast Optics. Irregular watch crystals cast to shape instead of formed from sheet are a definite possibility for the near future.

The same company is also producing welding cover plates, the clear covers which protect the glass filters in welding helmets from the pitting action of metallic welding sparks. The CR-39 cover plates are $\frac{1}{2}$ by 2 by $\frac{1}{16}$ in. and cost about 10¢ as against 1¢ each for glass cover plates

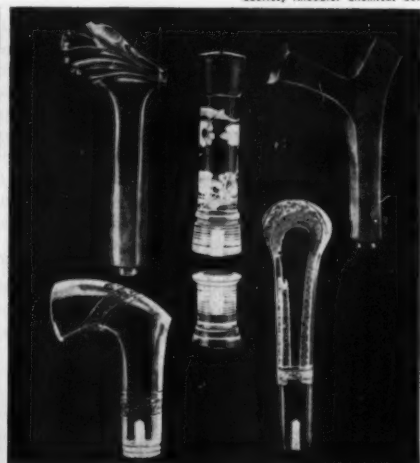
One of the largest cast acrylic embeddings ever produced contains all components of a telephone. Each panel weighs 140 lb., measures 30½ by 42½ by 2½ inches

Courtesy Vernon-Benshoff Co.



Umbrella handles are one of the major applications of cast phenolic. These are made by Alphonse Knoedler Co.

Courtesy Knoedler Chemical Co.



² "Gifts in Polyester," MODERN PLASTICS 26, 138 (July 1949).

CAST PART; CAST MOLD

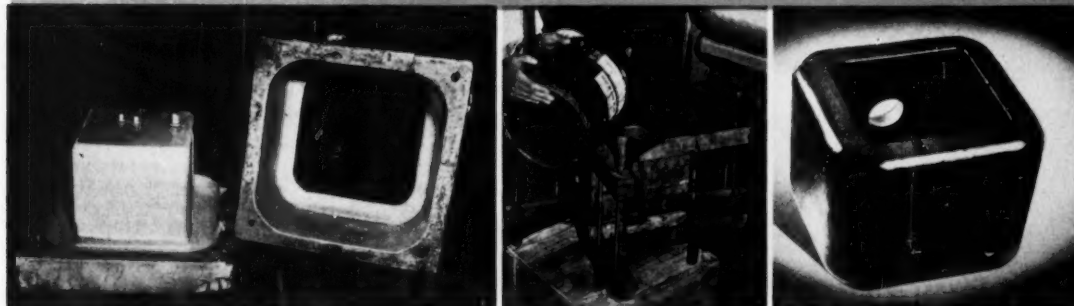


Photo courtesy Durez Plastics & Chemicals, Inc.

The Tiselius Electrophoresis apparatus, made by Perkin-Elmer Corp., makes a double use of Durez phenolic casting resin. The resin is used for one of the major parts of the machine and for the mold in which that part is cast. The sample to be studied in the machine must be placed in a tank immersed in an ice bath. The tank measures 8 by 8 by 7 in. (inside dimensions) and has walls about 2 in. thick so as to give a minimum of heat conduction. The two-part mold (left) used to cast the tank was made of phenolic casting resin. The mold is assembled, clamped, and the casting resin poured into it (center) to produce the one-piece tank (right). Several inserts are cast into the part, and some machining is necessary after casting. The Durez phenolic piece was produced for Perkin-Elmer by Atlas Plastics, Inc., Buffalo, N. Y.

But the CR-39 cover plates will outlast the glass ones by about 100 times!

One field in which CR-39 can compete with glass and which may soon account for a large poundage of the material is heavy-duty automotive glazing. This development has been hampered by the fact that the laws in many states prevent the use of anything but safety glass for automobile or truck windows. But Cast Optics has produced many truck windows cast to shape. These windows, distributed by Commercial Auto Maintenance, Inc., New York, N. Y., cost about twice as much as safety glass. But they have been used in those applications where the breakage problems were the most acute and have lasted 10 times as long as safety glass.

Other Materials

Acrylic. Strictly speaking, every fabricated acrylic product can be considered a cast product because it is made from cast rod or sheet stock. But the number of acrylic items which are actually cast to shape are few and far between. Cast embedments are probably the only application of any importance as far as volume is concerned.

Acrylic embedments have already

been covered in these pages.³ The only development of note in the field recently is a tendency towards larger castings. Plastic Developments, Inc., Attleboro, Mass., has produced one embedment which weighs 75 pounds. Vernon-Benshoff Co., Pittsburgh, Pa., one of the pioneers in the field, recently produced two panels, each 30½ by 42½ by 2½ in. in which all the components of a telephone instrument were embedded. Each panel weighs 140 pounds.

Vernon-Benshoff, which had previously been active only as a custom caster, has recently introduced a line of stock decorative items with flowers, fishing flies, or undersea motifs embedded. The line includes paper weights, book ends, table lighters.

Styrene. Although few applications of any significance have been found as yet, it should be mentioned that styrene can be and is being cast. Cast Optics Corp. is producing cast styrene sheet ½ in. in thickness and thicker. The material is optically clear, can be formed like acrylic, and costs 25% less than acrylic. But its lack of abrasion resistance has been the main drawback.

A special casting resin developed for potting applications by the Na-

tional Bureau of Standards and announced this spring is basically a modified styrene.⁴

Furan. Other casting materials, the furan resins, are used for various specialized applications, but have yet to find any large volume uses. Calcerite, made by Furan Plastics & Chemicals Co., Glendale, Calif.,⁵ is used mainly in the tooling industry for making models for pantograph and duplicating machines. Duralon, made by The United States Stoneware Co., Akron, Ohio, is used as a space-filling compound in pilot plant chemical equipment, as a thick pattern material, and for anchoring metal jacks in porcelain insulators.

Such, in brief, are the cast plastics. Because of their properties and the inherent disadvantages of casting as a process, these materials will seldom produce developments of world-shaking importance. They will seldom steal many markets from other materials when the other materials are not in short supply. But they still have their place. For certain jobs, cast plastics alone can provide the answer—and not all of those jobs have been discovered yet.

³ "Embedded in Acrylic," MODERN PLASTICS 25, 91 (Feb. 1948). "Displays Award to Hamilton Watch Co.," MODERN PLASTICS 26, 126 (Sept. 1948).

⁴ "Development of the National Bureau of Standards Casting Resin," by Philip J. Franklin, David M. French, and Wilbur C. Nyberg. National Bureau of Standards Circular 493.

⁵ "Ready-to-Cast Compound," by John Delmonte, MODERN PLASTICS 25, 98 (April 1948).



Cast parts courtesy Applied Resins Corp.

The versatility of casting is proved by this display of phenolic and polyester handles, industrial parts, rods, electrical parts, and decorative items (left to right, above)

looking at cast phenolic with renewed interest in recent months. Cast phenolic buttons are usually fabricated from button blanks cut from rod stock. Some button makers are also showing an interest in phenolic casting resin for casting large buttons to shape in elastomeric molds.

Cast phenolic also seems to be staging a comeback as a material for

bracelets, beads, and other costume jewelry. This is partly due to the shortage of brass and partly to the whims of fashion which seem to go in cycles and bring materials in and out of favor every 4 or 5 years.

Other applications for cast phenolic include umbrella handles and other similar decorative handles; dominoes, poker chips, Mah Jongg tiles, and other small pieces for the games field; bases for desk pen sets; small housings, especially for short-run production. Another application now being promoted by Catalin is the use of models fabricated from cast resin sheet stock for photoelastic stress analysis.

Phenolic casting resin. Metal-forming dies, such as those used in the aircraft industry for forming sheet aluminum, are by far the most important single application for phenolic casting resins. Catalin, Marblette, and Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y., manufacture resins for this purpose.

Rezolin, Inc., Los Angeles, Calif., has recently announced a new casting resin called 8000 Tool-Plastic. This material, manufactured for

Rezolin by Durez, is said to eliminate the shrinkage encountered in previous materials of this type. The 8000 resin is used with an accelerator paste—either a standard paste which cures overnight at 190° F. or a Quick-Set paste which sets up immediately at room temperature.

In addition to forming dies, phenolic casting resins are used for spinning chucks, jigs, plating shields, and foundry matchplates.¹ And recently Kaiser-Frazer Corp. pioneered another use which may soon consume large quantities of the resin. While tooling up for the Henry J, Kaiser-Frazer reportedly cut months from the usual tooling time by making its body dies from plastic models cast in female plaster molds which had been cast directly on the original clay model of the car.

In all of the foregoing applications, the phenolic casting resin is used as a means of making industrial parts out of other materials. There are also many applications in which the parts themselves are made of the casting resin. Because of the slow rate of production and the consequent high

The clasp is cast of polyester resin, has colorful trout fly embedded in it



¹ "Plastic Foundry Matchplates," by Franz Schumacher, MODERN PLASTICS 27, 95 (Nov. 1949).



unit cost of cast parts, casting resins are economically justified only for short runs. On such jobs, the low mold costs enable cast materials to compete with molding materials, particularly if the part involves thick section or undercuts.

For extremely short runs, casting can often compete successfully with fabrication. For example, one terminal block required in a quantity of 20 was cast of phenolic by Applied Resins Corp., Newark, N. J. The cast blocks cost \$10 each; a fabricator would have charged \$70 per piece to produce 20 of the blocks. Another example cited by the same caster is an aircraft connector which was produced for \$3 per unit on an order for 24 units. The quotation for fabricating the parts in the same quantity was \$30 per piece.

The wide variety of parts which can be made by casting is illustrated by the photograph on pp. 60 and 61. The parts shown (some of which are cast of polyester and some of phenolic) were all produced by Applied Resins. Included are handles of various types; terminal blocks and other electrical parts; plaques, book ends, and statuettes; cast rods; and various industrial parts.

Applied Resins makes its own rapid-cure phenolic casting resin,

Arco-Lite, and its own vinyl plastisol flexible mold material, Arco-Flex. The mold material can also be used as a casting medium when flexible castings are required.

Another modified phenolic casting resin, Kemplas, has recently been developed by Pennsylvania Salt Mfg. Co., Philadelphia, Pa., and is being made for General Ceramics & Steatite Corp., Keasbey, N. J. The latter company is using the material in the production of a new line of corrosion-resistant chemical processing equipment.

Kemplas is either cold cast or laminated with glass cloth and then molded into the desired shape. The cast pieces can be machined and threaded in the field and can be joined to one another by cementing with the same resin.

General Ceramics is currently producing a wide range of castings including valves, pumps, pipe fittings, and cast vessels up to 30 in. in diameter. The material has also been tested for electrolytic cell covers, fans, agitators, towers, headers, ejectors, nozzles, and lined steel pipe.

Polyesters

Polyester resins suitable for casting are made by American Cyanamid Co., New York, N. Y.; Pittsburgh



Lenses for safety glasses, sunglasses, and ophthalmic blanks are cast of CR-39

Tuning rod for radar equipment is made of polyester resin cast around metal





Courtesy Purdue University

Gears fabricated from cast phenolic are used for photoelastic stress analysis

Plate Glass Co., Pittsburgh, Pa.; and Marco Chemicals, Inc., Sewaren, N.J. The main application for such resins is for potting electrical circuits for electronic equipment, small radios, and hearing aids. This type of application will be discussed in a separate article in an early issue of MODERN PLASTICS.

With the same limitations mentioned above in regard to phenolic casting resins, the polyesters are used for casting industrial parts for experimental runs or other short runs. Some such parts are shown in the photograph (pp. 60 and 61) of castings produced by Applied Resins.

Another example of such a casting is the tuning rod for radar equipment cast of Marco resin by LeConte Plastics Co., Inc., Babylon, N. Y., for Airborne Instruments Laboratory,

Mineola, N. Y. The tuning rod was produced by placing the metal core in an aluminum tube with a centering disk on each end and then pouring in the resin. A tight seal between the plastic and the metal was necessary, and could not be economically produced in any other manner in the quantities required.

A third field of application for cast polyesters is embedments. Pikes Peak Plastics, Inc., Colorado Springs, Colo., is using Selectron for casting tie chain pendants with trout flies embedded in them.

Because of their color range and the ease with which they can be cast to intricate shape, there have been some attempts to use polyesters to produce statuettes and other giftware items.² To date, however, this application has met with only limited success.

Allyl (CR-39)

One of the most interesting of the cast materials insofar as recent progress is concerned is allyl diglycol carbonate or, as it is better known, CR-39. This material, made by Columbia Chemical Div., Pittsburgh Plate Glass Co., can be used to cast objects with optical clarity, and with abrasion resistance and heat resistance unobtainable in other clear plastics.

Ophthalmic lens blanks are being cast to power with CR-39 by The Amorlite Lens Co., Inc., Pasadena, Calif., and by Optical Plastics Corp., Stamford, Conn. The plastic lenses are lighter than glass, are virtually

unbreakable, will not fog up, and are sufficiently abrasion resistant to last at least until the lenses need changing because of a change in prescription. The blanks can be ground to shape by oculists in the same manner and with the same equipment used for glass lenses.

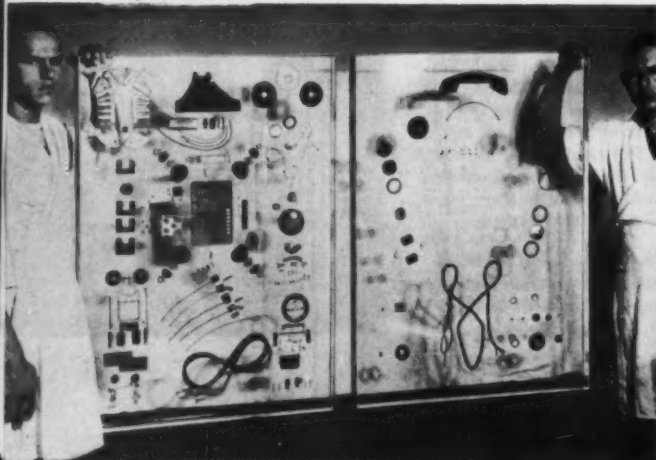
The lenses made by Optical Plastics are distributed by Univis Lens Co., Dayton, Ohio. Optical Plastics also casts CR-39 sunglass lenses and safety goggle lenses for Apex Optical Corp., Providence, R. I.

Because of its optical clarity, CR-39 is also being used to cast Schmidt correction lenses for projection-type television receivers, optical wedges, photographic filters, and instrument windows. Cast Optics Corp., Riverside, Conn., which is casting these products, reports that CR-39 has been adopted for windows on 85% of the instruments made by Sperry Gyroscope Co. The company also reports that CR-39 is the only material considered completely acceptable for military watch crystals. Electro Seal Watch Crystal Co., New York, N. Y., is distributing watch crystals made of 0.040, 0.050, or $\frac{1}{16}$ -in. thick CR-39 sheet produced by Cast Optics. Irregular watch crystals cast to shape instead of formed from sheet are a definite possibility for the near future.

The same company is also producing welding cover plates, the clear covers which protect the glass filters in welding helmets from the pitting action of metallic welding sparks. The CR-39 cover plates are $4\frac{1}{2}$ by 2 by $\frac{1}{16}$ in. and cost about 10¢ as against 1¢ each for glass cover plates

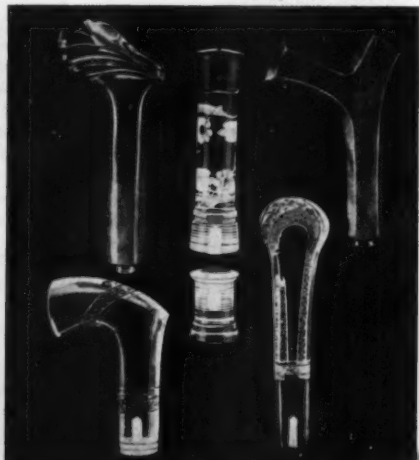
One of the largest cast acrylic embedments ever produced contains all components of a telephone. Each panel weighs 140 lb., measures $30\frac{1}{2}$ by $42\frac{1}{2}$ by $2\frac{1}{2}$ inches

Courtesy Vernon-Benshoff Co.



Umbrella handles are one of the major applications of cast phenolic. These are made by Alphense Knoedler Co.

Courtesy Knoedler Chemical Co.



² "Gifts in Polyester," MODERN PLASTICS 26, 138 (July 1949).

CAST PART; CAST MOLD

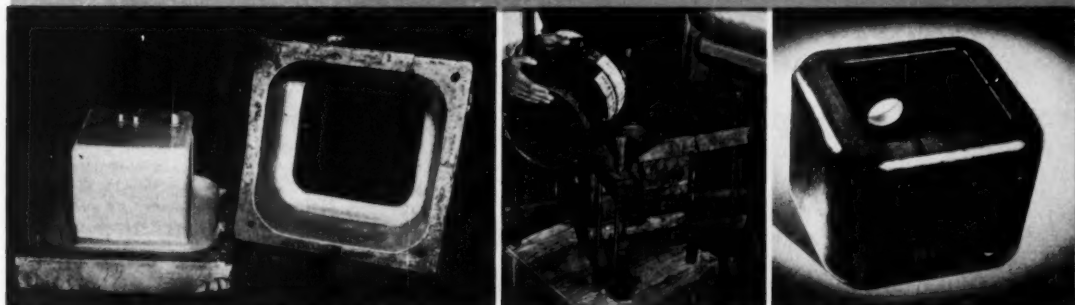


Photo courtesy Durez Plastics & Chemicals, Inc.

The Tiselius Electrophoresis apparatus, made by Perkin-Elmer Corp., makes a double use of Durez phenolic casting resin. The resin is used for one of the major parts of the machine and for the mold in which that part is cast. The resin is used for one of the major parts of the machine and for the mold in which that part is cast. The sample to be studied in the machine must be placed in a tank immersed in an ice bath. The tank measures 8 by 8 by 7 in. (inside dimensions) and has walls about 2 in. thick so as to give a minimum of heat conduction. The two-part mold (left) used to cast the tank was made of phenolic casting resin. The mold is assembled, clamped, and the casting resin poured into it (center) to produce the one-piece tank (right). Several inserts are cast into the part, and some machining is necessary after casting. The Durez phenolic piece was produced for Perkin-Elmer by Atlas Plastics, Inc., Buffalo, N. Y.

But the CR-39 cover plates will outlast the glass ones by about 100 times!

One field in which CR-39 can compete with glass and which may soon account for a large poundage of the material is heavy-duty automotive glazing. This development has been hampered by the fact that the laws in many states prevent the use of anything but safety glass for automobile or truck windows. But Cast Optics has produced many truck windows cast to shape. These windows, distributed by Commercial Auto Maintenance, Inc., New York, N. Y., cost about twice as much as safety glass. But they have been used in those applications where the breakage problems were the most acute and have lasted 10 times as long as safety glass.

Other Materials

Acrylic. Strictly speaking, every fabricated acrylic product can be considered a cast product because it is made from cast rod or sheet stock. But the number of acrylic items which are actually cast to shape are few and far between. Cast embedments are probably the only application of any importance as far as volume is concerned.

Acrylic embedments have already

been covered in these pages.⁵ The only development of note in the field recently is a tendency towards larger castings. Plastic Developments, Inc., Attleboro, Mass., has produced one embedment which weighs 75 pounds. Vernon-Benshoff Co., Pittsburgh, Pa., one of the pioneers in the field, recently produced two panels, each 30½ by 42½ by 2½ in. in which all the components of a telephone instrument were embedded. Each panel weighs 140 pounds.

Vernon-Benshoff, which had previously been active only as a custom caster, has recently introduced a line of stock decorative items with flowers, fishing flies, or undersea motifs embedded. The line includes paper weights, book ends, table lighters.

Styrene. Although few applications of any significance have been found as yet, it should be mentioned that styrene can be and is being cast. Cast Optics Corp. is producing cast styrene sheet ½ in. in thickness and thicker. The material is optically clear, can be formed like acrylic, and costs 25% less than acrylic. But its lack of abrasion resistance has been the main drawback.

A special casting resin developed for potting applications by the Na-

tional Bureau of Standards and announced this spring is basically a modified styrene.⁴

Furan. Other casting materials, the furan resins, are used for various specialized applications, but have yet to find any large volume uses. Calcerite, made by Furan Plastics & Chemicals Co., Glendale, Calif.,⁶ is used mainly in the tooling industry for making models for pantograph and duplicating machines. Duralon, made by The United States Stoneware Co., Akron, Ohio, is used as a space-filling compound in pilot plant chemical equipment, as a thick pattern material, and for anchoring metal jacks in porcelain insulators.

Such, in brief, are the cast plastics. Because of their properties and the inherent disadvantages of casting as a process, these materials will seldom produce developments of world-shaking importance. They will seldom steal many markets from other materials when the other materials are not in short supply. But they still have their place. For certain jobs, cast plastics alone can provide the answer—and not all of those jobs have been discovered yet.

⁴ "Embedded in Acrylic," MODERN PLASTICS 25, 91 (Feb. 1948). ⁵ Displays Award to Hamilton Watch Co., MODERN PLASTICS 26, 126 (Sept. 1948).

⁶ "Development of the National Bureau of Standards Casting Resin," by Philip J. Franklin, David M. French, and Wilbur C. Nyberg. National Bureau of Standards Circular 493.

⁷ "Ready-to-Cast Compound," by John Delmonte, MODERN PLASTICS 25, 98 (April 1948).

Laminated



Bottom, top, and end panels are joined to each other by 32-ply molded rounded corners 1 3/4 in. thick. Car can be shipped knocked down, then assembled with a resorcinol adhesive

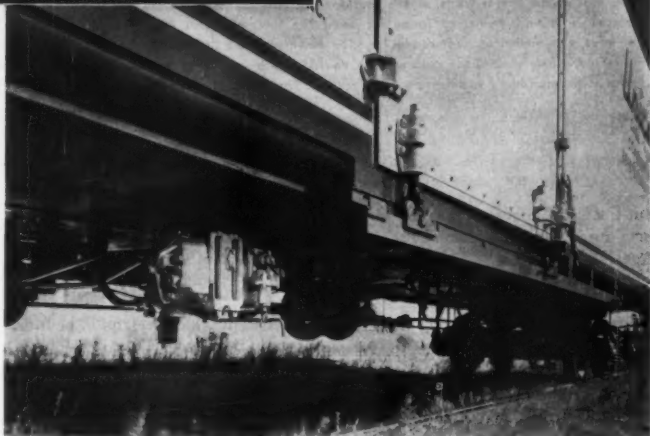
Wearing surfaces of Unicel car need no painting or refinishing. Color and car markings are an integral part of phenolic-impregnated paper surface

PHENOLIC and resorcinol resins have made possible a revolution in railroad freight car design and construction. By their use, a new laminated wood freight car is lighter than the standard car, will carry a bigger load, is less expensive to build, is easier to keep clean and maintain, and will last much longer.

The new car, known as the Unicel, was introduced recently by Pressed Steel Car Co., Inc., Chicago, Ill. The body is made of Douglas fir plywood bonded and laminated with a phenolic resin adhesive into eight panels (bottom, top, two ends, and four side sections) which, in turn, are bonded to molded laminate corners with resorcinol to make a single-unit car. In addition, wearing surfaces are surfaced with decorative phenolic-impregnated paper.

But the principle of the Unicel design is even more unusual than the materials used. The car is built so that stresses are distributed through the entire structure instead of being borne by a center steel sill or keel. Conventional cars must be designed for concentrated stress up to 50,000 p.s.i., but the Unicel car distributes the stress forces so that the maximum stress at any particular point of the carrier is 3000 p.s.i.

Strength of the Unicel car has been proved by a number of impact tests of the prototype. Although railroad



men consider speeds of 4 to 10 m.p.h. as collision test speeds, the Unicel has been repeatedly impacted at speeds of more than 15 m.p.h. without damage.

Pressed Steel Car Co. says that a railroad will be able to buy 1200 Unicel cars for the price of 1000 ordinary cars. Furthermore, Unicel cars will probably never need major rebuilding, whereas ordinary cars last only about seven years before major repairs, and then have only another five years of service before rebuilding.

Details of Construction

The Unicel car weighs only 37,000 lb. as against 45,000 lb. for the conventional freight car. But the former has a load limit of 132,000 lb. as against only 124,000 for the conven-

tional car, and the Unicel is 10 ft. longer inside.

Roof and sidewalls of the Unicel car consist of two skins of plywood bonded to a framework of 16-in. square cells made of 1 by 2 fir strips. The outside skin is 3/4-in. 3-ply plywood and the inside skin is 5/8-in. 5-ply plywood. The skins are bonded to the framework with Synco 128-CLW, a phenolic resin adhesive made by Snyder Chemical Corp., Bethel, Conn. The bonding is done with Thermex high-frequency equipment made by The Girdler Corp., Louisville, Ky.

The Synco adhesive was chosen because: 1) its physical strength exceeds that of wood; 2) it is resistant to weather and temperature extremes; 3) it is resistant to chemicals, bacteria, and fungi; 4) it shows no

Freight Cars

Revolutionary design uses phenolic- and resorcinol-bonded

wood for maximum strength and light weight; wearing surfaces are phenolic-impregnated paper

evidence of fatigue or failure under prolonged flexing; 5) it is adaptable to rapid production.

Each sidewall of the Unicel car is made up of two panels, but the roof is a single resin-bonded panel 49 ft. 4 in. long by 8 ft. 1½ in. wide. The floor of the car is also a single panel. Its framework is made of fir 2 by 8's laid up with the transverse members 2 in. apart on centers. In addition, the area for 9 ft. from each end is extensively reinforced with solid rows of wood blocks bonded together with phenolic resin.

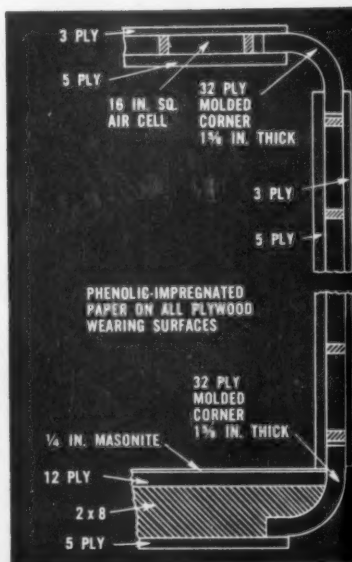
A ¾ in. 5-ply skin is bonded to the bottom of this framework and a 1¼ in. 12-ply skin is bonded to the top to serve as the car floor. A replaceable Masonite Tuftop wearing

surface ¼ in. thick is laid over the floor.

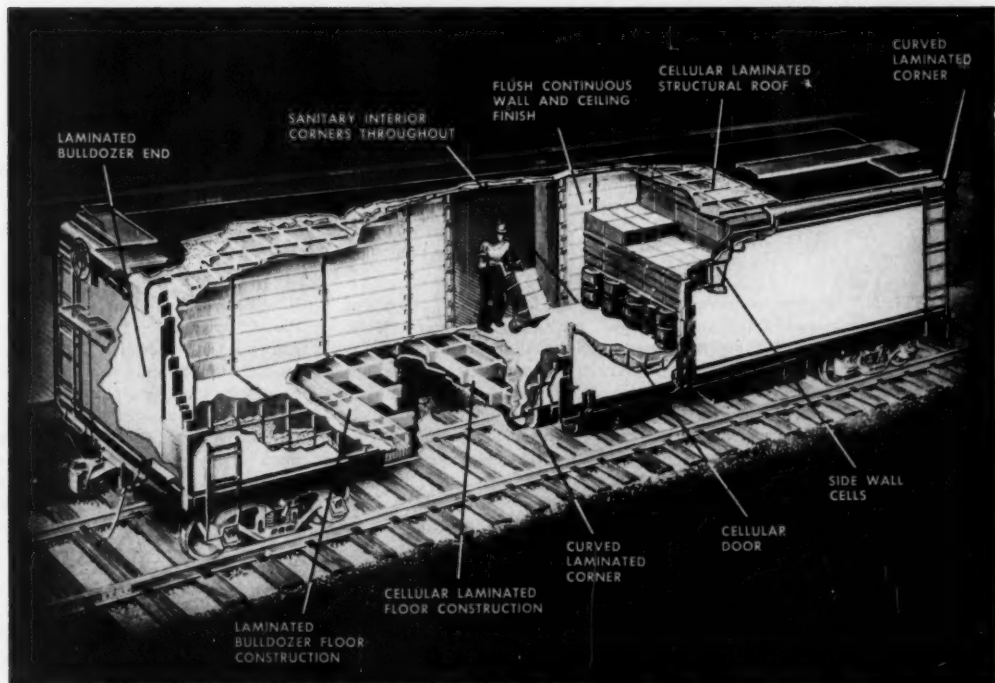
Each end of the car is made up of 3¾-in. wide strips of plywood bonded together to produce a slab of laminated wood about 9 ft. high, 9 ft. wide, and 3¾ in. thick. These heavy "bulldozer" ends are bonded with a cold press technique. The yoke block at each end of the car is a 4 ft. by 10 ft. by 10¼ in. piece built up in the same manner. The coupling gear is attached to this yoke block.

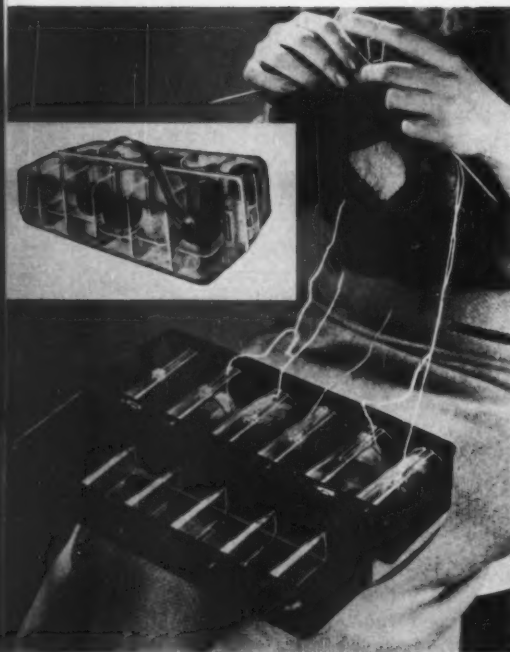
The 32-ply molded corners of the Unicel car are 1½ in. thick; they are bonded together and to the panels with resorcinol. This method of assembly requires only simple tools and facilities. It is thus possible to ship

(Continued on p. 150)



Details of construction of Unicel car are shown in cross-section diagram (right) and cutaway drawing (below). Insulation in cellular panels is used only in reefer car





Tunnels in adjustable styrene compartments make it easy to pull yarn. Box has room for knitting and 24 separate balls



Conventionally shaped boxes are modernized by using oval design and plastics. Several colors are available in transparent and simulated-alligator

Yarn Kept Under Control

Plastics containers of styrene, vinyl, and acetate aid knitters; molded box divided into compartments makes intricate patterns easier to follow

SOMETHING different in the way of aids to knitters of fancy patterns is a compartmented styrene box which has room for 24 separate balls of yarn. The compartments are adjustable, and are fitted with a tunnel arrangement so yarn can be pulled easily. The balls of yarn cannot roll away; they stay clean and in sight until the whole knitting job has been done. Ideal for knitters of argyle patterns, the box eliminates time-consuming untangling of bobbins when knitting with several colors. There is ample space to keep the knitting in the box along with the yarn.

All parts of this box, which is

molded by Plastic, Inc., Pasadena, Calif., for Crony, Alhambra, Calif., are built in or flush, and hence no snagging of garments or stockings need worry the user. It operates by means of spring hinges, and will lie open flat on the lap, making it convenient for those who like to knit on trains or buses. The vinyl carrying strap, made by The Rex Corp., Cambridge, Mass., adds color to the unit and can be removed when the box is open.

Oval Boxes

Knitting boxes which are more conventional in shape are made by Everett Transparent Container Corp.,

New York, N.Y., but have been modernized by employing an oval design and plastic materials. These materials, vinyl and acetate, were chosen for their excellent durability, their workability, and their attractive appearance. The containers are made in several sizes, and are provided with convenient carrying straps and secure lids. They are made in several colors in the transparent style, as well as in simulated alligator, also in a choice of colors.

Ovalizing one of the boxes necessitated special modification of the machines used in manufacture and introduction of a special machine to heat seal the seams.

Polyethylene on Paper

Coating offers many advantages for commercial and military applications. Details of the extrusion process

CONSIDERABLE tonnage of polyethylene coated paper is being bought by manufacturers of multi-wall bags and is also going into a wide variety of packaging and specialty applications. So useful are the properties which polyethylene brings to the coated paper field that the potential market is many times that of the present.

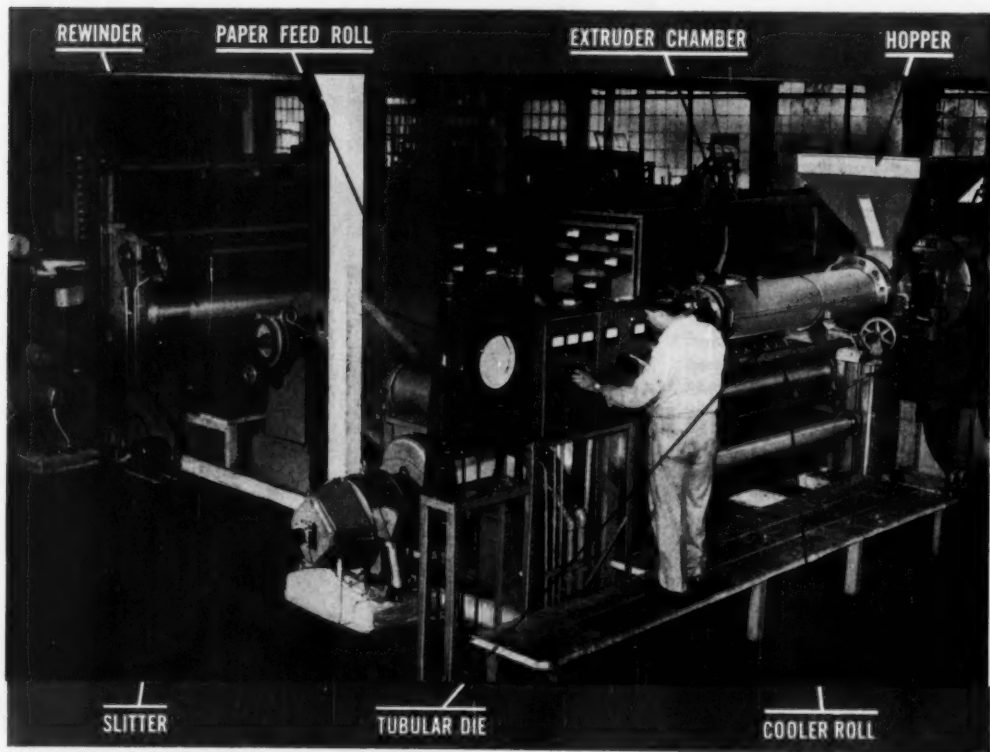
The properties which make polyethylene so important as a coating

for paper include chemical inertness, light weight, toughness, tear strength, extensibility, flexibility at low temperatures, grease-proofness, water vapor-proofness, and heat sealability. Further, polyethylene is free from taste, odor, and toxicity, and can be colored by pigments and dyes. It has good heat stability and is easily formed or shaped by thermal means.

The extrusion coating process is employed by St. Regis Paper Co. for

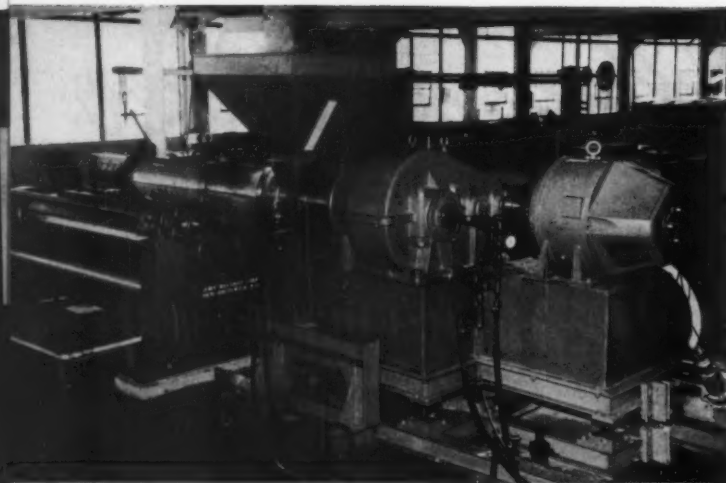
applying polyethylene on paper.¹ Kraft papers so coated are finding many important uses in today's economy other than in shipping sack applications. For example, they are particularly adaptable as a protective barrier ply in wrapping machinery and equipment parts to prevent corrosion during transit. As a result,

¹ St. Regis has adopted the trade-names *Plyolene* for multiwall bags with an inner ply of polyethylene-coated Kraft paper, and *Poly-Wrap* for polyethylene-coated paper used for frozen food wrapping.



All illustrations courtesy St. Regis Paper Co.

General view of 10-ton coater having a capacity of 3000 lb. of polyethylene-coated paper per hour in any width up to 90 in. and with film thicknesses from 0.5 to 7 mils. Paper receives coating at front end of machine, then is carried to slitter and rewinder



Extruder drive motor is at the right. Entire extruder mechanism is mounted on hydraulic base (center) which pivots to permit easy accessibility to the die and other parts of the extruder for cleaning and adjustment

Detailed view of extruder, built to specifications by Hartig Machine Co. Liquid polyethylene meets paper at nip of counter-rotating rolls and is solidified by steel water-cooled roll in foreground. Coated paper emerges at bottom for trip to the rewinder

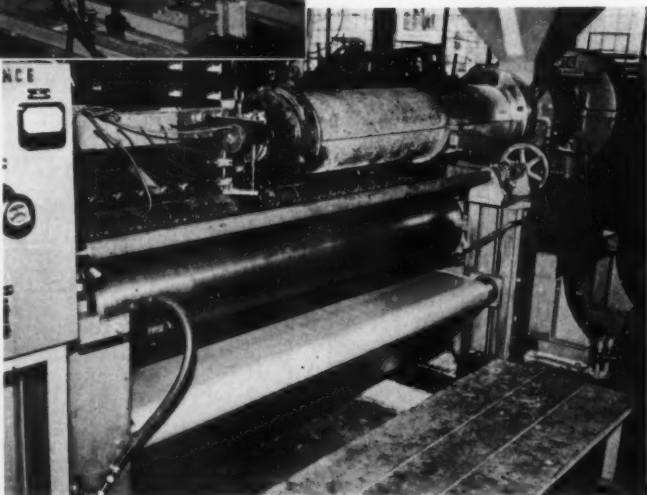
many new military uses are expected to open up for the product.

Polyethylene is an extension of the paraffin wax formula $(C_2H_4)_n$ and is generally available in molecular weights ranging from 300 to 23,000, with research work underway to push the molecular weight still higher. Generally speaking, St. Regis has found that the 19,000 molecular weight polyethylene resin is satisfactory for most commercial paper coatings, although experimental work has been carried out with polyethylene having a molecular weight of 21,000.

Facilities Tripled

Recently placed in commercial production, St. Regis' second polyethylene coating machine has tripled the company's facilities for coating Kraft paper. The first polyethylene extrusion coater went into production more than a year ago in the Oswego, N. Y., plant; the second and larger coating unit is now in operation at the St. Regis paper mill in Carthage, N. Y.

While the new coating machine embodies many modifications and improvements over the first one, both setups utilize identical basic methods and principles in applying the resin to paper. In brief, the process consists of extruding the polyethylene in molten or fluid form onto the paper in the nip between two counter-rotating rolls. In practice, the process is as follows: polyethylene crystals are fed into the storage hopper of the



coater, and transported by screw through a heated extrusion chamber that extends across the width of the machine. The heated screw chamber is located at the front end of the coater, and its housing is equipped with a series of thermostatically controlled heating coils which heat the chamber to between 500 and 600° F. on the average. In its passage through the chamber, the polyethylene resin is melted to a liquid state.

Pressure exerted by the revolving extruder screw on the liquefied polyethylene forces the material through a set of screens to prevent any unmelted particles of resin or contamination from leaving the screw chamber. From the filter screens, the liquid polyethylene is conveyed to the center of a tubular die having an ad-

justable slot opening at the bottom, extending the full width of the die. This die also is electrically heated and thermostatically controlled. Because polyethylene requires no special corrosion-resistant alloys to prevent chemical attack, the die has a long operating life.

As the thin film of liquid polyethylene is forced through the die slot it drops a few inches into the nip of two rollers—one rubber and one steel—directly below. Kraft paper is passed over the rubber roller and downward through the nip against the water-cooled steel roller.

The counter rotation of the two rollers toward one another pulls the polyethylene film into the nip as it drops from the die slot, thus pressing the coating onto the surface of the

Kraft sheet. The flow of cooling water through the jacketed steel roller is adjustable, depending on the output of polyethylene required. The position of the rubber roller is adjustable laterally so that the pressure against the steel roller can be increased to improve film adhesion. This lateral adjustment also facilitates cleaning the die. As the paper and polyethylene are carried around by the rolls, the cooled metal roll solidifies the coating and glosses the coated sheet. Generally a one-third wrap on the cooler roll is sufficient to achieve these ends.

Cut and Trimmed

From the cooler roll, the polyethylene-coated paper travels over a series of tension rollers, through knife bar supports and shear cutters—for trimming and cutting purposes—and then to the rewinder. The finished roll of paper is wound with the polyethylene coating on the inside.

To obtain a double-coated paper (polyethylene on both sides of the sheet), the process is repeated with the paper reversed. It is interesting to note that the first polyethylene coating is undisturbed during application of the second coating.

Capacity of the coating machine depends on the width and thickness of the polyethylene coating, temperature of the polyethylene into the hopper, capacity of the extrusion

chamber heating bands, and the cooling capacity of the cooler roll. The 10-ton coater at Carthage is designed to operate at a speed range of from 50 to 600 ft. per minute. Volumewise, this machine has a capacity of upwards of 3000 lb. of polyethylene-coated paper per hour in widths up to 90 inches. The Oswego machine has a capacity of 1000 lb. of coated paper per hour and a 58-in. maximum trim.

Coating thickness is determined by the relative speeds of the extruder screw and the base paper. Adhesion is determined by the temperature of the polyethylene at the point of contact with the paper, pressure between the squeeze rolls, finish of the paper, and the linear speed of the paper.

A system of electrical controls has been built into the coating machines to maintain predetermined levels of temperature, roll pressure, and machine speed. All are readily adjustable to vary the amount of adhesion and the thickness of polyethylene on the paper.

Experienced Operators

Because pressure of the rollers and speed at which paper passes through the nip have such a great bearing on adhesion and thickness of polyethylene coating, St. Regis has trained extrusion machine operators who have a background in printing press operations. Two men are employed



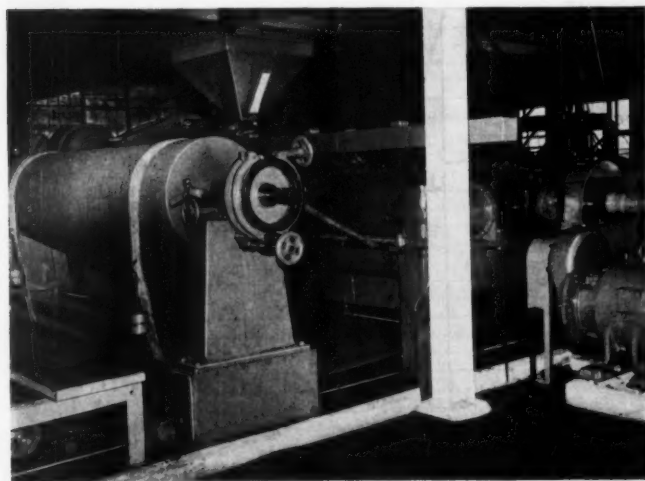
HARTMAN



ARNOLD

The accompanying article and illustrations on the extrusion coating of polyethylene by St. Regis Paper Co., were prepared from material made available by Carl H. Hartman and Dr. K. A. Arnold, and from data supplied by Bakelite Div., Union Carbide and Carbon Corp. and E. I. du Pont de Nemours & Co., Inc.

Mr. Hartman is technical director of the St. Regis Multiwall Bag Div. and is assisted by Dr. Arnold, director of the Research & Development Dept. for the division.

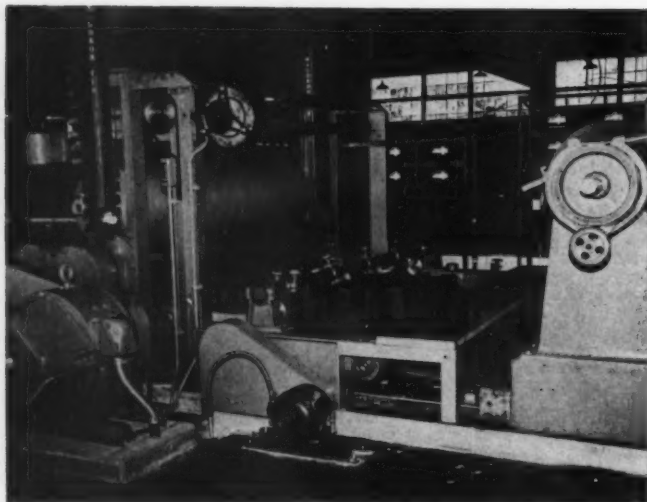


Paper feed roll of coating machine (left) accommodates rolls up to 48 in. in diameter. Hopper, extruder chamber, and die from which polyethylene emerges are in background

on each of three shifts, with the coating machines operating 24 hr. a day. It is desirable for the machine to run continuously once it is started, because excessive stopping and starting will cause formation of carbonized polyethylene material in the die jaws, due to oxidation. For most efficient operation, the machine must be free of such carbon formations. Also, the heating and make-ready time for starting results in excessive scrap material and delays in manufacturing schedules; therefore such coating machines are uneconomical on a short-run basis.

The equipment described is capable of producing a wide range of commercial coating thicknesses, from $\frac{1}{2}$ to 7 mils. However, most commercial coatings to date have been $1\frac{1}{2}$ mils, which is approximately equal to 20 lb. of polyethylene per 500 sheets of 24 by 36-in. paper. Indications are that coatings as low as 5 lb. may become commercially practical, although the thinnest commercial coatings undertaken in the multiwall bag field have been 15 lb. to the ream. Requirements for Poly-Wrap do not demand such thick coatings; 8 lb. per ream are used here.

The company recently employed the General Foods Moisture Vapor



Slitter and rewinder of coating machine. Knife bar supports and shear cutters are in center. Rewinder (left) by John Waldron Corp., is equipped with rubber ironing rolls

Transmission method, most generally accepted test in this country, to determine the moisture-vapor permeability of various weights and thicknesses of polyethylene coatings on 50-lb. basis weight Kraft paper. The tests were conducted at 100° F., 95% relative humidity on the complete range of polyethylene coatings currently employed by St. Regis in the commercial construction of multiwall bags for shipment of various hygroscopic materials. The accompanying graph shows the amount of moisture-vapor transmission through polyethylene coatings ranging from approximately 8 through 30 lb. per ream on 50-lb. basis weight paper. The transmission is expressed in terms of grams per 24 hr. per 100 sq. in. of polyethylene-coated paper. Creased samples of polyethylene-coated paper were used in these tests to simulate field conditions wherein multiwall bags frequently undergo a substantial degree of creasing and folding during the course of storage and handling.

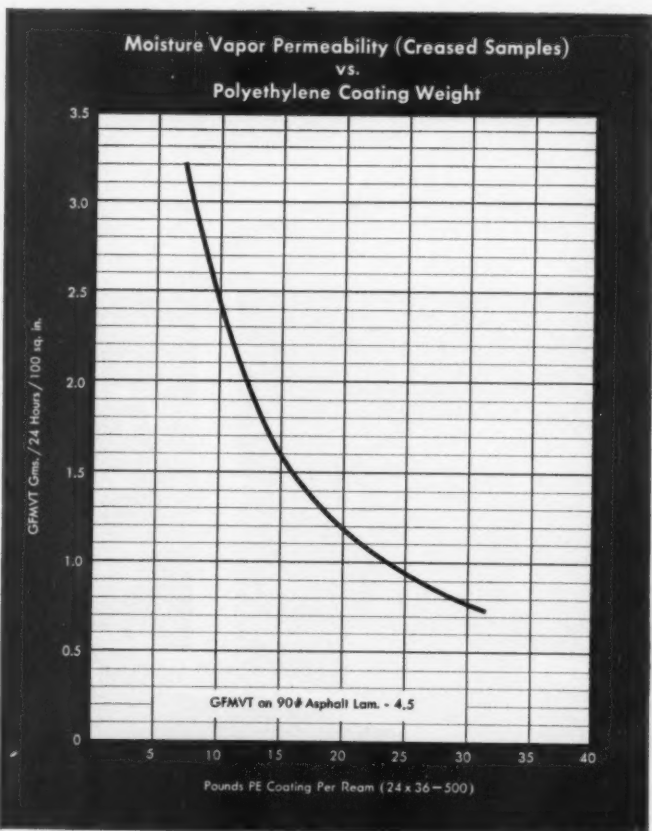
Test Comparisons

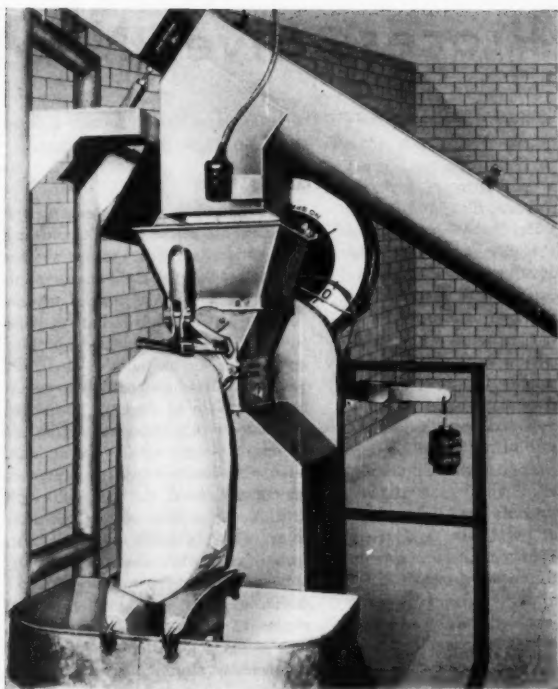
A 10-lb. polyethylene coating on 50-lb. basis weight paper resulted in moisture-vapor transmission of 2.3 grams. GFMVT tests on creased asphalt-laminated papers produced a moisture-vapor transmission of 4.5

gm. per 24 hr. per 100 sq. in. of sample.

As the polyethylene-coating thickness or weights increased, the moisture-vapor permeability decreased until, at a weight of slightly more than 30 lb. of polyethylene per ream, it reached a low transmission reading of 0.7 grams. Extension of the tests from this point indicates a leveling of the moisture-vapor transmission line as the polyethylene weights are increased. Indications are that the moisture-vapor transmission will not drop below 0.3 gm. on polyethylene coatings up to a weight of 100 lb. per ream.

As previously noted, moisture-vapor transmission tests have been conducted on creased and folded samples in an endeavor to approach a real evaluation of polyethylene-coated papers when made up into multiwall bags. In addition, the end closures used on these bags have a





Automatic machine for packing edible meat trimmings in multi-wall bags constructed with a polyethylene-coated paper inner ply



Multi-wall bags with polyethylene-coated paper inner ply protect flavor and quality of meat trimmings, prevent freezer burn

direct bearing on the moisture-proof qualities of the container when considered as a whole.

With this thought in mind, St. Regis, along with its various laboratory tests, also conducted field tests with ammonium nitrate packed in bags that included one ply of paper coated with approximately $1\frac{1}{2}$ mils of polyethylene and closed with a polyethylene-coated sleeve, and sealed at both ends by means of wax dipping. Results showed that the bag absorbed 0.25 of 1% of moisture over a period of two months. The same bag without wax dipping absorbed 0.4 of 1 percent. Other bags made with two asphalt-laminated plies, wax dipped ends, and a moisture-proof sleeve absorbed 1% moisture. All of the bags were stored in a testing room where the atmospheric conditions are regularly maintained at 85% relative humidity and a temperature of 90° F.

Drop tests in conjunction with this and other investigations indicate that when bags are normally constructed from four or five plies, including two asphalt-laminated sheets of the type heretofore used in bag constructions,

the two latter sheets can be replaced with a single 50-lb. Kraft ply coated with a polyethylene thickness of less than $1\frac{1}{2}$ mils, and still retain an equally good strength factor under normal atmospheric conditions. This strength factor comparison should be even more favorable during exposure to cold weather.

Several factors contribute to an excellent economic picture for polyethylene-coated papers. The factors include 1) low specific gravity (large volume or surface per pound), 2) no additives or further processing involved, 3) fabrication by thermal means, and 4) an expectation of a declining cost of raw materials in the future brought about as a result of expanded production.

Multiwall paper bags with the polyethylene-coated inner ply have been in growing demand over the past several months. One of the relatively important uses of this type bag, with the coated ply at the innermost position and the polyethylene coating facing the product, is found in the packaging of polyethylene resins in crystalline form and of other molding compounds. The polyethylene

coating provides a scuff-proof surface, eliminating the possibility that the packaged products might become contaminated by uncoated paper fiber loosened by abrasion during shipment. It is emphasized that the polyethylene ply in the innermost position is not necessary or even desirable where protection from atmospheric moisture is the only consideration. In that case the polyethylene sheet would serve as well—if not better—when positioned as the second ply of the bag. The cost of the multi-wall paper bag for this use is not too important a factor because, in general, bags of this class are used to replace more expensive shipping containers previously employed.

Plyolene bags also are being used for the shipment of fertilizers and chemicals, and in some cases have eliminated multiwall bags utilizing the asphalt-laminated sheets. In addition to chemicals, Plyolene bags are employed to ship edible meat trimmings, powdered milk, dried eggs, and other food products; peat moss and humus materials; and a wide variety of other hard-to-pack commodities.

Embossing Process Gives New

An embossing process which creates the illusion of depth on a flat surface is going to have a great influence on the future of surface-decorated plastics film and sheet, according to Dr. Paul Dornbusch of Krefeld, West Germany. The new technique, developed by Dr. Dornbusch and called Echolux, is based on a study of light reflections and the creation of patterns which pick up and reflect light at various angles.

This development may well serve as another forward step in the efforts of vinyl film producers to create original designs which maintain the character of vinyl as a distinctive material in its own right.

Ever since vinyl film and sheet were first produced, there has been a tendency to imitate the surfaces of other materials. Familiar leather grains and fabric patterns were first employed not only because this was the easiest course to pursue, but also because the material was accepted so readily that producers took neither the time nor trouble to develop new design patterns. In light-weight film, fabric patterns and imitation weaves were first adopted for the same reasons.

But ever-growing competition is forcing producers to search for new and different decorative effects that will take advantage of vinyl plastic's molding and embossing possibilities to permit its presentation as a material that is not only new in texture but has unusual and individual designs. The trend in this direction started more than a year ago, and the Dornbusch process has


come along as one of several aids to speed up its further development.

Pattern Theory

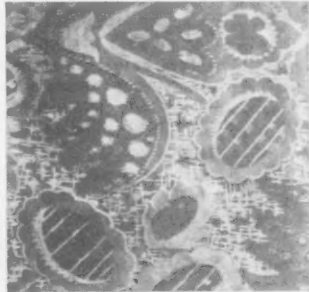
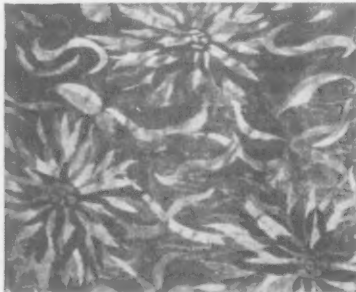
The Dornbusch embossing patterns enable the material to pick up light and reflect it in various shades depending upon the angle from which the film is viewed. The underlying theory is based upon ruffle point—that is, the motif is broken up into areas of parallel lines set down in different directions to make up the all-over design. The lines may be curved, straight or angled, as long as they retain parallelism. When the film bearing the design is turned or moved, the lines show up in different shades of the reflected color. Thus, a black sheet or film with a design embossed thereon may appear to be colored in several shades of gray depending upon the angles of the lines in various pattern areas. The effect is a sort of iridescence similar to mother-of-pearl or to that obtained by two different weaves in a fabric.

The appearance of depth and shading on Echolux-embossed thin film is largely an illusion; unlike most other embossed surfaces, there is very little relief—that is, the surface feels smooth to the touch. There are, of course, very minute depressions between the pattern lines, but they do not strike through and on 4-mil film are scarcely visible to the naked eye. From a short distance the film looks as though it might have been printed by some spectacular process in various shades of one color.

Heavier-gage vinyl may also be



Some of the many patterns produced by process described in this article are shown above, right, and lower left, opposite page



Effects

Pattern design is based on parallel

lines in various areas; 30,000 patterns are available

embossed with the Echolux technique, but so far there has been no particular interest in doing so. Heavy-gage film is generally quite deeply embossed with a resultant heavy strike-through.

Embossing Rolls

The engraved steel rolls for this particular embossing process are made by the Dornbusch company in Germany and distributed in the United States by F. A. Ringler Co., New York, N. Y. Dornbusch claims to have the world's largest collection of embossing patterns and grains (30,000 of them) which were preserved in a bomb proof shelter during the war. From four to eight weeks are required for shipment of the rollers from Germany. They are furnished in sizes of from 41 to 76 in. in length and from 7½ to 18 in. in diameter. Cost, depending on size, ranges from \$750 to \$3000. Rolls can be used on other embossing machines, but are particularly adapted for use on the Dornbusch embossing calender.

Several unusual features are claimed for this recently improved embossing calender which is now in use in several American film and sheet plants. First, it can be used for straight embossing at high speed. Or, if the operator prefers, he can perform three operations on one pass through the machine. In addition to embossing, he can lay color in the depressions and top the

ridges or high spots with another color—all in one operation. By the older embossing methods, it has generally been necessary to emboss first and then use separate doctor blade operations for topping and for inlaying.

The coloring operation can be applied with the Dornbusch machine to sheet of any standard thickness from 8 mils up, as well as to fabric-coated material. In fact, various types of combination work can be turned out on this machine. If he chooses, the operator can disengage the topping and inlay rolls and insert a straight design printing roller in the topping attachment. In such cases he can emboss a particular grain on the surface and lay down a one-color printing job over the grain. Embossing rolls can be changed in from 17 to 40 minutes.

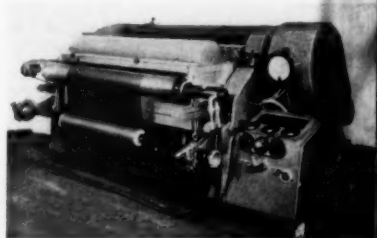
Rubber Counter Roll

Another feature of this embossing machine is a rubber counter roll used instead of the more common hard paper roll. Nearly all roller embossing calenders use two rolls—the engraved roll and a counter roll which is virtually a male die. The counter roll as well as the engraved roll usually has to be removed whenever a new pattern is to be embossed. In this new machine the same rubber counter roll is used

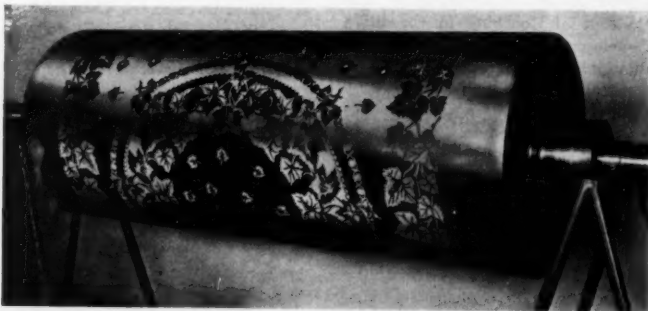
regardless of whatever engraved roll the operator may choose to run. This particular machine employs a heated engraved roll for thin film, a cold roll for thick sheet, and a cooled counter roll in either case. Speeds of 30 yd. a minute for film have been attained by this process in comparison to half that rate by some of the older methods.

Another factor of particular interest to processors who handle other materials in addition to vinyl is that this embossing machine can also be used for fabric, leather, rubber, cellophane, Celluloid, aluminum foil, and paper. The engraved rollers provided by Dornbusch can also be used for embossing wood, plywood, sheet metal, and even glass.

The embossing principle involved can be applied to almost any surface from silk to cement, according to Dr. Dornbusch, thus making possible a periodic change in the "feel" of various materials and creating "cycle styles" of immense value in a merchandising world that is always seeking "something different" to stimulate the consumer.



Versatile embossing calender performs a number of operations simultaneously



Engraved embossing roll is large enough in circumference to make it possible to produce one complete damask-type vinyl tablecloth for every revolution in the machine

S. P. I. National Conference

SESSIONS of the Swampscott conference were organized by general committee chairman George V. Sammet, Jr., Northern Industrial Chemical Co., and his committee, as a cooperative project with professors of the Harvard School of Business lecturing at the morning sessions on October 19 and 20.

Seminar on Personnel

Presiding officer for the session was Sherwood L. Young, C. F. Church Mfg. Co. Prof. James J. Healey discussed "Organized Labor's Quest for Security," pointing out recent trends in the approach of various unions in various fields to the related problems of job security, security against inflation, and security for old age. Prof. Healey made the important point that too much security can be a deterrent to incentive.

Production lessons to be learned from World War II were discussed by Prof. Frank F. Gilmore who showed the main differences between economic trends in material and skilled labor supply and in the credit picture today as against the year 1940.

There is going to be a tremendous expansion in industrial capacity, the over-all goal being 30% more goods and services in the next five years. This will mean the need for additional management talent and more and better training of executives.

A lesson the Plastics Industry can learn from World War II is that flexible and rapidly changeable and expandable production programs must be set up.

Prof. Myles L. Mace spoke on "The Concept of Coaching in Executive Development." One of the principles upon which this concept is based is the training of young executives by individuals and in small groups—practically tutoring on the job.

Thursday Luncheon Session

At a luncheon meeting presided over by Howard A. Jones, New England Tape Co., Inc., the properties of rigid plastics, their use and misuse, were discussed by Robert Burns, Bell Telephone Labs. Mr. Burns covered the principal categories of rigid plastics in terms of their usefulness in

A serious and concerned group of delegates numbering 450 attended the annual meeting of The Society of the Plastics Industry at the New Ocean House, Swampscott, Mass., Oct. 18, 19 and 20. Thought-provoking theme of the conference was "Plastics Manufacturing in Mobilizing U. S. A."

parts where mechanical and electrical integrity are essential. He discussed cold flow, stress release, service temperature, crazing and cracking, and mentioned unusual electrical properties of various plastics.

Compression Molders Meeting

N. A. Backscheider, Recto Molded Products, Inc., presided over the compression molders session.

Speaking of the new frontiers for impact materials, Saul M. Silverstein, Rogers Corp., said that the plastics industry still is not yet in a position to take any material and economically produce automobile bodies from it. He said that the industry's failure is not congenital but has resulted from a lack of imagination and perhaps courage. His company produces a plastics board which it would like to sell in large size and by the ton at lower prices. If the engineers would take this board and look upon it as an alloy and develop the tools and dies to form it by the square yard instead of the square centimeter, then the plastics industry would almost surely be making automobile bodies and other large items. There is now more than at any time in history an impelling need for constructively creative seekers of new frontiers.

In talking of the future, Dan H. L. Jensen, Philco Corp., stated that the future for moldings over 20 lb. is directly controlled by their cost as compared with other materials which can do a comparable job. Over 20 lb., metal becomes a factor. Philco has introduced such a stamped metal table-model television cabinet, and Mr. Jensen stated that the metal cabinet is being well accepted in the 20-lb. category and that its cost is \$2 under a comparable cabinet of plas-

tic. He went on to say that his company, like many others, will be designing larger plastic parts because materials will flow better and molders will find means to cure more quickly thereby increasing the yield per cavity.

Compression molding of reinforced plastics was discussed by Clare E. Bacon, Owens-Corning Fiberglas Corp., who said that the compression molding of glass-reinforced plastics brings to compression molders markets heretofore impractical by offering a material with properties unequaled by any other material on a weight basis. Fiberglas reinforcements are being supplied as yarns, fabrics, mats, cut strands, and rovings. With these five forms of reinforcements, almost any application becomes practical. Any resin can be reinforced with glass fibers although the bulk of such reinforced plastics products marketed today is being produced with unsaturated polyester resins. Molds should be designed so that as they close, they shear the pre-form, thereby confining the resin under pressure.

Informative Labeling

Toastmaster for the banquet on Thursday evening was George V. Sammet, Jr. Elmer French, Firestone Plastics Co., and head of the S.P.I. Informative Labeling Committee, presented his report on the activities of the committee, outlined the Society's plans for continuing and expanding the promotion of informative labeling, and officially introduced the new handbook on the subject prepared by the Informative Labeling Committee.

Feature speaker of the evening was John Fisher, a Canadian broadcaster and lecturer.

Management and Marketing

The second Harvard Business School session was under the chairmanship of Charles J. Romieux, American Cyanamid Co. Prof. John G. McLean discussed "Managerial Problems in Plastics."

The subject of an address by Edward C. Bursk, editor of the *Harvard* (Continued on p. 144)



Plywood hull of race boat is strengthened by Fibreglas-resin sandwich construction. Boat acquires added sturdiness, but hull weighs only about as much as conventional types. Four cowlings, which are molded of same materials over a form, weigh less than 6 pounds

Reinforced Race Boat Hull

Designers aim at new record speed of over 100 miles per hour

ALTHOUGH most racing power boat hulls are plywood, various materials and methods of construction have been tried in efforts to combine sturdiness with light weight. One interesting answer to the design problem is found in the Bevlyn, a 19-ft. boat owned by R. W. (Rick) Keller of Detroit, Mich. The plywood hull is reinforced with Fibreglas and polyester resin.

The performance of Bevlyn in rough water races, such as the around-Manhattan race last September, has convinced its owner that its hull is stronger than necessary although it weighs about the same as conventional hulls—about 850 pounds. This winter Keller hopes Bevlyn will better the 96-m.p.h. world record for the 7-litre class.

The hull of the Bevlyn has three-point contact with the water when running at optimum speeds. Its wooden frame (shown upside down in Fig. 1) was assembled with Cycleweld and covered with skin made of $\frac{1}{16}$ -in. aircraft plywood reinforced with one thickness (about 0.020 in.) of Fibreglas on the side next to the framing. The Fibreglas was bonded to the plywood with Selectron resin.

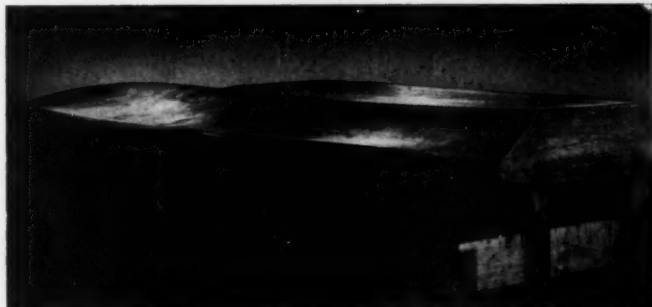
After the skin was attached to the frame, the outside of the skin was covered with one to three layers of Fibreglas, depending upon the strength requirements. The excess glass cloth hanging over the edges is visible in Fig. 2.

The cowlings on the boat were molded of Fibreglas and Selectron, and the four cowlings together weigh less than 6 pounds.

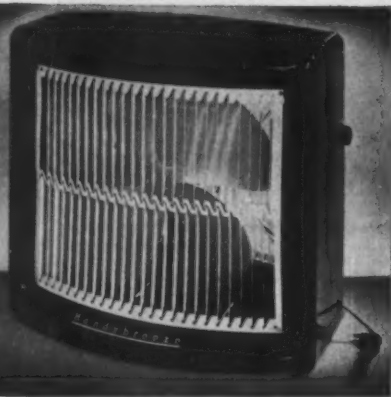


1—Single thickness (about 0.020 in.) of fiber glass reinforcement is bonded by polyester to $\frac{1}{16}$ -in. plywood skin on side next to wooden frame (shown here bottom side up)

2—Outside of plywood is covered with from one to three layers of glass fiber after skin is attached to wooden frame. Note the excess glass cloth hanging over the edges

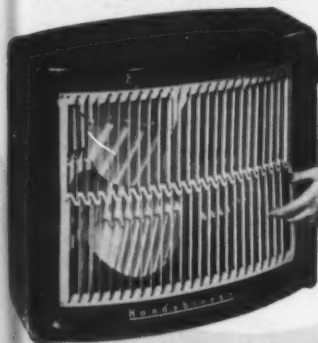


Two-Part Housing

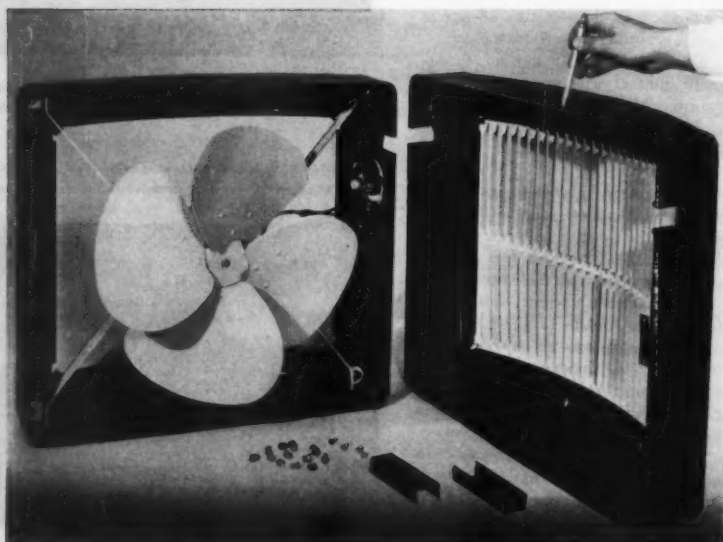


Pleasing design is achieved by using identical halves for phenolic housing of cabinet fan. Production in single-cavity die holds down tooling period and costs

All Photos Courtesy Durez Plastics & Chemicals, Inc.



Arrangement of tongue and groove sections along inner edge of two halves locks parts together with a secure, inconspicuous joint. Pencil indicates one tongue. Metal joining strips fasten to 10 cored ribs ending just short of the molding edge. Slots near top form convenient recessed handles when halves are joined. Motor and fan assembly is anchored to molded-in threaded male inserts in rear half



MORE and more plastic housings are making their appearance these days for products ranging from knife sharpeners and household scales to business machines, inter-communication units, and television cabinets.

One of the most recent and interesting jobs in this category is the phenolic housing used by Chicago Electric Mfg. Co. for its 16-in. Handybreeze Dial-Aire cabinet-type fan. Made in two identical halves, this housing measures approximately 20 in. high, 23 in. wide, and 14 in. deep at the widest point. Total charge weight of the two mottled walnut pieces, molded of long-flow Durez and Plenco materials, is approximately 18 pounds. Plastic Molders, Inc., Chicago, Ill., produces these components and is also responsible for the foresight in tooling which made it possible to turn out complete cabinets with a single-cavity mold. This approach enabled Chicago Electric to produce a sturdy, smartly styled fan housing

from Single Die

Long-flow phenolic used to produce

identical halves gives cost and other advantages over wood or metal

while holding the tooling period and die costs to a minimum.

In explaining their choice of molded plastic for this housing, representatives of the company point out that a cabinet of drawn metal would have imposed design limitations and involved greater tool costs. A metal housing would also have necessitated costly finishing operations and would have acted as a sounding board for the fan and motor, giving rise to noise during operation. The uncertain steel supply outlook was another factor favoring adoption of a plastic cabinet. A wooden cabinet would also have restricted design possibilities and would have required costly fabrication and finishing.

The Dial-Aire cabinet fan is versatile. With its stable, rectangular design, the fan makes an attractive addition to any home or office, and may be used as a floor fan, on an end table, or placed in a window to function as an exhaust fan.

The two halves of the fan cabinet fit together back-to-back to form the completed cabinet. Through an ingenious arrangement of intermittent tongue and groove sections along the inside edge, the parts lock together to form a secure, inconspicuous joint. This fit is made possible by spacing the individual tongues

and grooves so that they mate when the pieces are back-to-back. The half-cabinet molding has a slot in each side near the top. When the housing is assembled, these slots line up to form convenient recessed handles.

Ribs Aid Assembly

Somewhat unusual is the method used to join the cabinet halves. In addition to the supporting ribs above and below the handle slots, each molding carries 10 internal ribs—four on the top and bottom and one centered on each side. These ribs end just short of the edge of the molding and are cored to facilitate assembly. At the Chicago Electric plant, continuous metal strips are fastened to the ribs by means of thread-cutting screws with countersunk heads. Then the strips on opposing halves of the housing are brought together with short bolts. This arrangement, plus the tongue and groove feature, results in a rock-firm assembly.

The cabinet rests on four rubber feet inserted into drilled openings in the base. Two other holes drilled in the right side of the cabinet provide mounting for the control knob and an inlet for the electric cord. The front grille, stamped from sheet steel and finished in white enamel,

is bolted to the cabinet through cored bosses at the four corners of the cabinet opening. The identical back grille is bolted to short metal supports for increased accessibility.

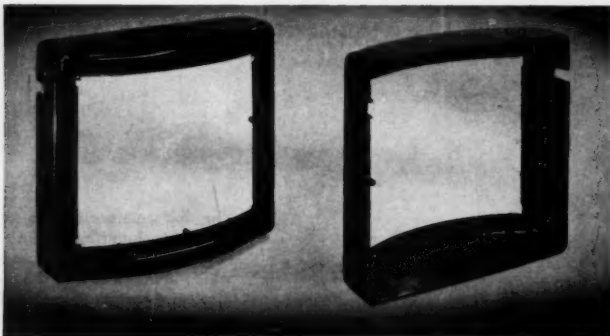
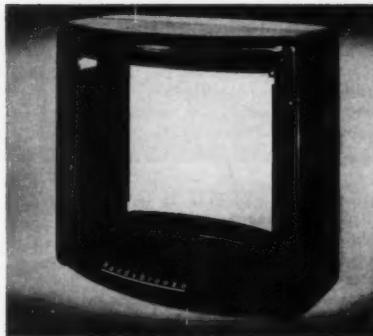
The fan and motor assembly is mounted in the housing with metal supports extending from the inside corners of the rear casting. These supports fasten to molded-in threaded male inserts and are insulated with rubber grommets, providing a floating mount for fan and motor. On the moldings which are used as cabinet fronts, these inserts are omitted and the plastic is allowed to fill the opening in the bosses.

Two decalcomania transfers in white and light blue are used on the cabinet. These are supplied by Mosher Bros. Co., Chicago.

Although the Handybreeze cabinet is not intended for use as a seat, it will support the weight of an adult without damage. An ample wall section (0.220 in.), adequate use of reinforcing ribs, and smoothly contoured styling contribute to its unusual strength.

The cabinet halves are produced by straight compression molding on a 750-ton Lake Erie press, averaging 12 shots per hour. Preforms are electronically preheated in a 5-kw. Airtronics unit.

Left: Housing halves assembled. Right: Front (left) and back (right) parts unassembled. Two small holes drilled into right side of rear half provide mounting for control knob and inlet for electric cord. Trade-name and instructions are applied by decalcomania transfers





Squeezeable 2-oz. Plaxpak polyethylene bottle is supplied as a spray^{er} with model railroad colors for hobbyists and home craftsmen. The Flo-Mist Sprayer was tested at the Model Railroad Workshop at the 1950 Chicago Hobby Show and found to produce results which cannot be distinguished from those obtained with expensive air brushes. The squeezeable bottle is made by Plax Corp., Hartford, Conn., and is sold with colors made by Floquil Products Inc., 1993 Broadway, New York, N. Y.

The nylon-bristled Healthmaster is a bath brush of radically new design. The bristles are set in a long flexible coil of cellulose acetate butyrate; thus the entire brush curves to fit the body contours and also stretches as the extruded vinyl straps are pulled. The foot-long vinyl handles are removable; they can be unsnapped and the brush then held by metal rings at the ends of the butyrate coil. The butyrate coil is extruded by Schwab & Frank Inc., 2937 E. Warren Ave., Detroit, Mich., and the vinyl handles by the Plastics Div., The B. F. Goodrich Co., Marietta, Ohio. The Healthmaster brush was designed and is manufactured by Clarence P. Hornung, 220 E. 46th St., New York, N. Y.



PLASTICS

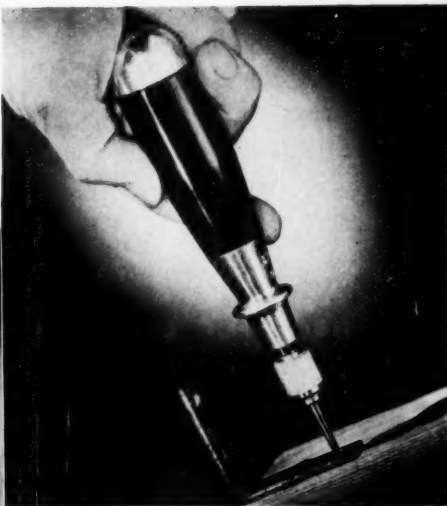


Modern canister set molded of styrene has heavy wall sections to insure durability. It holds 6 lb. of flour, 5 lb. of sugar, 2 lb. of coffee, and 1 lb. of tea. Set is available in yellow with white covers or red with white covers. Lettering is silk-screened on each of the canisters. Made by Loma Plastics, Inc., 3000 W. Pafford St., Fort Worth, Texas.



The doll's clothes can be kept neatly arranged on the Wannatoy clothes rack. The 9½-in. high rack and the 4-in. hangers are molded of Hercules cellulose acetate. The set, which includes five of the clothes hangers, is packed in a colorful carton. It is manufactured and distributed by Dillon-Beck Mfg. Co., 1227 Central Ave., Hillside, N. J.

Doll with Vinylite plastic body has a blank face made of rigid vinyl sheet. Thus the young owner can change the doll's facial expression by erasing the old one and drawing a new one with the crayons which come with the doll. An accompanying folder contains simple instructions on how to draw different expressions. The doll's colorful costume is also vinyl and is thus as easy to keep clean as the doll itself. The doll is manufactured by Scribbles, Inc., 36 E. 10th St., New York 3, N. Y.



Eight drill points are stored in the handle of the Yankee push drill. The handle is molded of black Tenite II cellulose acetate butyrate and has an aluminum screw cap. A. L. Hyde, Grenloch, N. J., molds the handle for North Bros. Mfg. Co., Div. of Stanley Tools, Lehigh Ave. & American St., Philadelphia 33, Pa.

PRODUCTS



The handy Safety-Flare plugs into the cigarette lighter outlet in the car and has a built-in magnet which holds it securely in position on any metal part of the car. It has a 12-ft. cord. The plug, light housing, and lens are molded of styrene by Lind Plastic Products Corp., 4451 W. Rice St., Chicago, Ill. The light is made and distributed by A. G. Busch & Co., Inc., 2632 N. Central Ave., Chicago 39, Ill.

A white horse for the young Hopalong Cassidy fans is made of Vinylite film. The imaginative youngster "rides" it by slipping into the hole in the middle of the toy which is held at the proper level by an adjustable vinyl shoulder strap. The horse can also be used as a water toy. It is produced and distributed by U. S. Fiber & Plastics Corp., Union St., Stirling, N. J.





Rescaler for ginger ale or soda bottles is molded in one piece of polyethylene, has no springs or clamps to work loose. The resilience of the material allows the Towntop to be tightly force-fitted over the bottle lip. Can be imprinted on top for use as advertising specialty item. Cap is manufactured by Green-Lite Sales Co., 2720 Third Ave., Bronx, N. Y.

Fringed woolen robes for use in the car or at outdoor sports events come with zippered carrying case which doubles as a clothes-protecting seat cover when empty. Cases are made of electronically sealed transparent Vinylite sheeting (below, right) or of tan vinyl sheeting on edges and one side, and checked woven fabric on the other (below, left). Both styles have shoulder straps for convenience in carrying. The cases are sold with robes. Produced by Troy Blanket Mills, 16 E. 34 St., New York 16, N. Y.



PLASTICS



Toy furniture more than three times as large as ordinary doll-house furniture is designed for the child old enough to be interested in playing at room arranging. The floor plan of six-room house comes with each set of furniture for a single room. Pieces molded of Bakelite styrene by Ideal Novelty & Toy Co., 200 Fifth Ave., New York, N. Y.

Air circulator designed for use on an executive's desk is only 5½ in. high and weighs 3¼ lb., but is said to do the work of an ordinary 10-in. fan. It keeps the air moving without setting up drafts which will disturb papers on the desk. The unit is housed in a molded Tenite I cellulose acetate case. Case is molded by Kusan, Inc., 2716 Franklin Rd., Nashville, Tenn., for National Reinforced Plastics Corp., Berry Field, Nashville.



Accurate scale models of Case tractor and spreader are molded of orange Tenite II cellulose acetate butyrate. The models have all the important features of full-sized equipment and can thus be used in the showroom as well as serving as educational and realistic toys for future farmers. Distributor and beater blades actually revolve when the spreader is pulled. These working models are produced by Monarch Plastic Products Co., Milwaukee, Wis., for J. I. Case Co., 702 State St., Racine, Wis.



PRODUCTS



Visor for mounting on the exterior of automobiles is made of a single formed sheet of transparent colored Plexiglas. It protects the driver and passengers against sun, road, and headlight glare but allows full visibility of traffic lights, street signs, and scenery. It is attached to the drip molding of the car and can be adjusted easily without tools to meet varying driving conditions and drivers' heights. The visor is available in soft green, blue, or red. It is manufactured by Sunwind Mfg. Corp., Pinellas Airport in St. Petersburg, Fla.



For youngsters who have to be coaxed to drink their milk, one solution to the problem is the Kit-Sip, which makes a game out of drinking. The milk is sipped through a straw "to make the kitty drink." The base of the Kit-Sip is molded of red styrene, and the candy-striped drinking tube is extruded of the same material. Made by Noveline Plastic Co., 108 W. 25th St., New York, N. Y.

Children's hands can be kept warm and dry in these mittens even during snowball fights or sleigh rides. The mittens get their moisture resistance from a coating of Vinylite resins formulated so as to remain flexible in cold weather. The mittens are available in red, green, and brown. Manufactured by Plasticote Glove Co., Inc., 1226 N. Fourth St., Milwaukee 12, Wis.



SPECIFY

HOBBED CAVITIES by MIDLAND

Home of the largest hobbing press in the plastics industry, Midland Die and Engraving is the ONE source qualified, equipped and manned to handle every Hobbed Cavity requirement—from the smallest tooth paste tube caps to radio cabinets, escutcheons and housings up to 80 square inches—nearly three times as large as ordinary hobbing limits. Typical examples of large hobbed cavities by Midland are the portable radio cabinet, radio cover and toy gunstock shown here.

Midland engineering, experience and facilities are ready to serve you—ready to deliver *on time* uniform, accurate hobbed cavities at a fraction of machining costs. Specify Hobbed Cavities by Midland on your Bill of Materials. Or write for further information and estimates. No obligation.

BILL OF MATERIAL

1 Soc. Hd. C. Scre

2 Drill Rod

3 Hobbed Cavity
by Midland
D & E

4 Mild Mech.

5 Drill Rod

6 Drill Rod

7 Mild Mech.

8 Screw

9 Screw

10 Mild Mech.

11 Mild Mech.

12 Drill Rod

DETAIL 3
8 REQ.

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Molding the 'Specialized' Plastics

LATE in World War II a number of new and specialized molding materials were under development for prospective use in projected military applications where none of the plastics materials then in existence would serve. A number of these applications—on the secret list then and still "classified"—required heat, chemical, and electrical resistances and physical strengths not generally associated with plastics.

Few molders have ever acquired even a nodding acquaintance with these special materials. Their development came so late in the war that there were few production jobs for military use; material cost in some cases was so high that civilian applications were infrequent and small in volume.

Now, with a new and colossal mobilization program under way, military procurement officers, scanning the properties required for components of new weapons, motors, vehicles, electronic equipment, and other matériel, are naturally looking to these unusual materials. They will be looking, also, for molders and fabricators who can handle them. From the standpoint of plain business sense, as well as pure patriotism, it is up to molders to learn about these materials and how to work them.

The purpose of the following group of articles is to introduce these materials to those who are unacquainted with them and to present the fundamental factors in their successful molding.

SILICONE RUBBER

by P. C. GERVAS and D. C. YOUNG†

DURING the past two years, notable improvements in the mechanical strength and serviceable temperature span of silicone rubber have been made by Dow Corning Corp. Also, the resistance to permanent compression set has been tripled in certain formulations. All types of silicone will withstand continuous exposure to temperatures of at least 300° F. for an indefinite period of time, and in most applications will withstand long-time exposure to 500° F.

One group of Silastic stocks and pastes is designed for general use at

temperatures from -70 to 500° F. while others are serviceable from -100 to 500° F. Although finished parts may cost several times as much as parts made of organic rubber, silicone is normally used to do jobs that no other rubber-like material can accomplish.

Although silicone may be molded, extruded, laminated, calendered, mill sheeted, mandrel wrapped, or solution coated, for the purposes of this article only molding techniques will be considered.

In order to satisfactorily handle silicone the following equipment is required: a two-roll mill equipped with a scraper blade, a steam or electrically heated compression press that operates with platen temperatures of 250 to 300° F., and an air circulating oven equipped with an automatic controller that will permit the temperature in the oven to be increased gradually at a

controlled rate. This oven must also be designed so that it will maintain a uniform and constant temperature of 480° F. Inasmuch as circulating air in the oven will contain volatile material, it should be vented outside the building and equipped with adjustable dampers to permit a constant intake of fresh air through the heating compartment.

Silastic stocks are fully compounded when shipped to the molder, but they should be milled for a few minutes at temperatures below 130° F. before molding. Silastic stocks of the 100 series should be milled for 1 to 5 min. but should be molded within 24 hr. of the milling. Silastic stocks of the 200 series, especially Silastic 250, should be milled with the rolls set for a loose bite until the stock begins to crumble. When a sufficient amount is crumbled, the rolls are tightened, and a portion of the crumbled stock is milled until it forms a smooth thin sheet. This sheet is removed with a scraper blade. The operation is continued until sufficient stock has been sheeted for the molding operation. The rolls are then opened, and the entire batch of sheeted stock is milled until it becomes soft. Silastic 250 should be molded within 4 hr. of final milling.

In the case of either series 100 or 200, if the milled stock is not molded within the required time limit it may be softened again as often as necessary by remilling. The milling operation is also used for reclaiming scrap. From 10 to 30% of scrap may be milled into a new batch of material and then processed in the same manner as 100% virgin stock.

The molding operations for the two series are performed somewhat differently although for all silicone materials, a mold release agent should be used. A 5% solution of a synthetic detergent such as Dreft or Vel in water should be sprayed on the hot mold. Sufficient

* Reg. U. S. Pat. Office.
† Dow Corning Corp.

time is then allowed for all water to evaporate after which the mold may be loaded. Dow Corning silicone mold release agents are not effective with Silastic.

In molding the 100 series, the platens should be heated to $250^{\circ}\text{F.} \pm 10^{\circ}$. If the temperature falls below 240°F. it will lengthen the molding cycle, but if the temperature is over 260°F. there is danger of bubbling when the molded part is removed from the hot mold. It is highly recommended that the mold be closed as quickly as possible after it has been loaded. The mold should be breathed to allow entrapped air to escape, after which the pressure should be reapplied and maintained for 3 to 5 min. for parts under $\frac{1}{8}$ in. in thickness. Parts between $\frac{1}{8}$ and $\frac{1}{4}$ in. will require 5 to 8 min. under pressure. For parts over $\frac{1}{4}$ in. in thickness, the time under pressure should be at least 10 min., after which the mold should be chilled to 170°F. before unloading.

For molding parts in the 200 series, the platens should be heated to $300^{\circ}\text{F.} \pm 10^{\circ}$. The mold must be closed as quickly as possible in order to eliminate pre-curing. Breathing is also necessary for this series, and for parts not over $\frac{1}{8}$ in. in thickness molding pressure should be maintained for 5 to 10 min.; for parts between $\frac{1}{8}$ and $\frac{3}{16}$ in. about 10 min. is required. For parts over $\frac{3}{16}$ in., the time under pressure should be about 10 min. with a subsequent chilling to 150°F. before removal. For each $\frac{1}{8}$ in. in thickness over $\frac{3}{16}$ in. an added 8 min. under pressure is needed.

All parts molded of silicone should

be given a final cure at 480°F. in an air circulating oven. In general, moldings over $\frac{1}{8}$ in. in thickness require an intermediate cure followed by a final cure. Inasmuch as these curing schedules vary considerably, it is recommended that the prospective molder contact Dow Corning Corp., Midland, Mich., for complete data on this portion of the operation.

Editor's Note: Dow Corning Corp. asks that requests for sample quantities of Silastic be specifically made only for application to experimentation of an essential nature.

TRIFLUOROCHLOROETHYLENE

KKNOWN by the trade-name Kel-F, trifluorochloroethylene has satisfactory properties over a temperature range of from a low of -320°F. to a high of 390°F. and excellent ability to withstand thermal shock within this heat range. No effect has been observed after exposure to sulfuric, hydrochloric, hydrofluoric, fuming nitric acids, aqua regia, strong caustics, and other vigorous oxidizing materials. It is equally resistant to other organic solvents, although it is slightly swelled by highly halogenated fluorinated hydrocarbons. Kel-F has zero water absorption and transmission. The non-wetting property of the material prevents the formation of a conductive path on the surface of electrical parts.

Kel-F, in the unplasticized form, has an impact strength of 3 to 4 ft. lb. per in. of notch at 77°F. and exhibits unusual toughness in the low temperature ranges. Plasticizer can be added to increase the toughness, flexibility, and resiliency of the base polymer without loss of its essential chemical resistance. The plasticizer is a lower molecular weight trifluorochloroethylene oil.

Kel-F can be made transparent or translucent to visible light; it is also sufficiently transparent to longer wavelengths in the infra-red region to be adaptable for use as window material on instruments using infra-red where high temperatures, corrosive atmospheres, and a need for excellent electrical properties

are involved. The degree of clarity or translucency can be varied by rapid cooling to obtain clarity or slow cooling or heat treating to increase the degree of translucency. Kel-F can be compounded with various fillers or pigments for special applications.

It has been adequately demonstrated that Kel-F can be molded by injection, transfer, compression, and extrusion methods on conventional equipment. Since it is possible to degrade it by excessive exposures to temperatures of 600°F. and above, the material should be molded at as low a temperature as possible consistent with production of well molded objects on a satisfactory cycle. When it becomes necessary to mold it at near the decomposition temperature, detailed attention should be given to equipment design to insure uniform heating with no hot spots. Generous use of multiple-temperature controls with well distributed thermocouples will pay off in saved molding time and minimum spoilage.

The character of the molding technique will determine the necessary molding time. For example, in compression and transfer molding, temperatures from 480 to 500°F. can be used satisfactorily; for injection molding, temperatures should be from 500 to 550°F. For extrusion, where the material is displaced rapidly, high die temperatures are necessary, with the extruder temperatures ranging from 525°F. in the forward end to approximately 400°F. in the hopper area. It has been found advantageous to extend the die bushing so that a small band heater may be placed around the bushing or a ring heater on its face. In this way the high die temperature can be localized at the orifice.

In compression molding, the ma-

Silicone gaskets are in contact with engine oil at temperatures to 450°F.

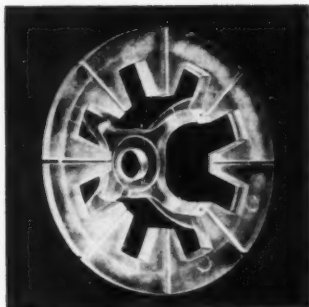
Courtesy Pratt & Whitney Aircraft



Table I.—Compression Molding Kel-F

Grade	#300	#270	#240
Molding temp.— $^{\circ}\text{F.}$	480	480	480
Thickness—in.	Pressing time—min.		
0.2	10	7	5
0.4	25	20	12
0.6	40	28	20
0.8	55	40	28
1.0	65	50	36

* The M. W. Kellogg Co., Chemical Mfg. Div.



Courtesy The M. W. Kellogg Co.

Injection-molded Kel-F tube seat base for a military electronic application

material is loaded in the die which is then closed slowly until a pressure of 200 p.s.i. is built up on the stock. As the stock starts to flow, the pressure gage will show a drop, after which pressure on the material must be raised slowly to 1000 p.s.i. with a ram speed of approximately $\frac{3}{16}$ in. per minute. This pressure is held until the mold is closed and the final cure is completed. At the expiration of the curing period (see Table I), the die is cooled rapidly. During cooling the pressure on the stock must be raised quickly to from 7000 to 10,000 p.s.i. This pressure is gradually bled so that it will have dropped to from 2000 to 3000 p.s.i. by the time the die has reached 250° F. If the temperatures shown in Table I are raised, the curing time will decrease. As an example, No. 300 grade material can be pressed in half the time given in the table if the temperature is raised to 570° F. The materials can be successfully pressed at the following temperatures: No. 300 between 480° and

590° F.; No. 270 between 465° and 535° F.; No. 240 between 445° and 500° F.; plasticized powders require 400° to 500° F.

Cold mold to cold piece shrinkage on heavy sections ranges from 0.005 to 0.010 in. per inch.

Injection molding of this material is carried out in the same manner as practiced with other thermoplastics, except that molding must be accomplished at a higher temperature level. See Table II. In transfer molding, the pot should be heated in the range of 480 to 550° F., the highest temperature being used with the highest grade number material. The die should be heated to the range from 480 to 550° F., and the molding powder should be heated to 300° F. After the material has been placed in the transfer pot it should be displaced into the mold as rapidly as it reaches a plastic condition. After the mold is filled out it should be cooled with full pressure maintained on it until the piece has "set up."

Because of the many variables encountered in extrusion of this material it is recommended that the prospective extruder contact The M. W. Kellogg Co., Chemical Mfg. Div., Jersey City, N.J., for more details than given above.

MINERAL-FILLED ALKYD

NEWEST of the thermosetting plastic molding compounds, mineral-filled alkyd offers an exceedingly high standard of electrical insulating characteristics, plus moldability at very high speeds at low molding pressures on either conventional compression molding presses or on high-speed fully automatic molding machines especially designed for handling this material.

The electronics and electrical industries have been the principal users of this material in such parts as electrical capacitors, resistors, tuning devices, terminal blocks, motor control devices, tube bases, and sockets.

On the average, the over-all molding cycles on alkyd can be figured as being between one-third and one-fourth the time necessary for

molding cycles with other thermosetting materials.

Alkyd parts are being successfully molded on both semi-positive and simple flash molds. No particular problems are encountered with alkyd in loading space since its bulk factor is slightly over 2 to 1.

The mold should be designed for relatively free fit. This loose fit allows free escape of flash, thereby permitting maximum flow of material. The punch should be provided with several narrow guide points and the balance of the vertical rise area cleared to at least 0.020 in. to allow for free flow and escape of flash. Alkyd molding materials are highly uniform in cold mold to cold piece shrinkage, requiring an allowance of 0.004 to 0.007 in. per inch. There is no measurable after-shrinkage from cold dimensions.

In general, the use of transfer molds is not recommended with alkyd. In many such molds the plastic phase is too short to permit the material to complete its travel through the gates and runners before cure sets in.

Mineral-filled alkyd is somewhat more abrasive than general purpose thermosets, and somewhat greater mold wear will therefore be encountered. However, because of lower molding pressure and the greater plasticity of the alkyd material, mold wear is not as great as is encountered with other mineral-filled thermosets.

Any press can be utilized for molding alkyd if it can be modified to close at high speed. It must close fast enough so that not more than 4 sec. elapse between the time material comes into contact with the heated mold and the time when full pressure is applied to the material.

An understanding of proper storage conditions of alkyd is perhaps more important than in the case of other plastics materials, inasmuch as aging in storage tends to produce two generally deleterious effects: 1) A gradual loss of plasticity; 2) A gradual loss of curability. If proper storage and handling practices are not followed, it is possible to mold apparently acceptable pieces which are in fact inferior in electrical or other properties.

Although molded alkyd has excellent water resistance, the granular form is extremely sensitive to moisture pick-up. Results of such pick-

Table II.—Injection Molding Conditions for Kel-F

Grade	#240	#270	#300
Molding temp. —°F. ^a	440-500	450-525	480-550
Molding pressures—p.s.i.	20,000-40,000	20,000-40,000	20,000-60,000
Die temp. —°F.	250-300	250-300	250-300

^a These temperatures for unplasticized material; use temperatures approximately 25° lower for plasticized material.

up are more serious than loss of plasticity which is likely to be self-apparent on attempted use.

It is believed that strict adherence to the following precautions will enable molders to avoid difficulties with alkyd compounds: 1) Granular alkyd should be stored at temperatures not exceeding 70° F.; 2) Drums of material should be kept tightly closed when not in use; 3) Drums from cold storage should be allowed to warm up to room temperature before being opened; 4) Granular material or preforms should not remain exposed to the atmosphere for any extended period of time, such as overnight. Inasmuch as each drum of material contains a percentage of fines, it is essential that the drums be thoroughly rolled in order to insure uniform distribution of the particles.

In the great majority of jobs, preheating of preforms is neither necessary nor desirable. Although alkyd does heat well in a high-frequency preheater, such an extra operation serves little purpose since the molding speed is usually already close to the maximum permissible on available press equipment. The use of cabinet preheating or of steam preheating is flatly not recommended.

In general, the use of alkyd in granular form without preforming is recommended. When absolutely required, however, granular alkyd preforms with ease although the resulting preforms should be handled under the same precautions mentioned previously regarding storage.

When molding alkyd, several important characteristics which differentiate it from normal thermosetting molding materials should be taken into account: 1) Its exceptionally high fluidity during molding makes possible a complete filling of



Courtesy Plaskon Div., Libbey-Owens-Ford Glass Co.

Properties of molded alkyd make it suitable for use in rotor (foreground) and seal rings (arrows) of a magneto

the mold at comparatively low pressures; 2) The curing reaction is exothermic, and cure proceeds with great rapidity; 3) Curing of alkyd is not accompanied by a chemical condensation and, therefore, gassing is not required; 4) Little difficulty is encountered in over-curing or burning at any commonly used thermosetting molding temperature.

Curing time will vary with mold temperature (see Table III) even though the reaction is exothermic, because a high mold temperature increases the speed at which the mass of material is brought to critical reaction temperature. Because of the speed of cure, molding conditions should be so set that a maximum of 4 sec. elapses between the time that the material comes in contact with the heated mold surface and the time that full molding pressure is applied.

Alkyd materials can be molded within a fairly broad range of effective molding pressures. In the case of granular mineral-filled alkyd, pressure ranges of 600 to 1200 p.s.i. have been found suitable. A good starting point is 800 p.s.i., with modifications upward or downward depending on the shape and size of the piece, the intricacy of cross-sections, the degree of material flow, and the amount of mold clearance. It is not recommended that molding pressures in any case exceed 1200 p.s.i. on the projected cross-section area of the molded piece. If the material will not fill out the mold within this range, the application of additional pressure will not correct the condition. Not filling out generally arises from tight fits in positive or semi-positive molds, or a

closing cycle above the 4-sec. limit.

The range of recommended molding temperatures is 275 to 330° F. The preferable range is from 300 to 320° F. The latter range will be found suitable in the great majority of cases, although it can be dropped to 250° F. where it is desired to take advantage of a slightly slower mold closing speed. This low temperature, however, is not recommended since it creates the danger of pieces sticking in the mold. The high limit of mold temperature may be used where the part is small or where the required flow is very little and maximum molding speed is desired.

Where a mold has been run previously on phenolic, urea, or melamine, it is necessary that it be thoroughly purged before alkyd is run. A liberal application of zinc stearate on the first few shots will usually achieve this result. In changing back from alkyd to another of the thermosets, it is also necessary to follow this same purging procedure.

The molding of alkyd around inserts is somewhat different than for other materials. On the one hand, the high fluidity of alkyd tends to assure complete flow and an initial gripping that is superior to other materials. On the other hand, the fact that alkyd does not show any after-shrinkage eliminates a factor which is often relied upon to bind inserts into the materials more tightly as time elapses. It is, therefore, necessary that the usual precautions on inserts be followed religiously. A generous amount of material should be allowed around the inserts, and the insert shape should be such as to provide for undercuts that will tend to lock the insert into the molded material.

Table III.—Cure Times for Plaskon Alkyd 420-1

Temp. °F.	Thickness in inches			
	1/2	3/8	1/4	3/16
270	145	95	55	25
290	125	80	50	15
300	95	70	40	12
310	90	65	40	12
320	85	60	35	10

MINERAL-FILLED MELAMINE

by WINSLOW A. WARD*

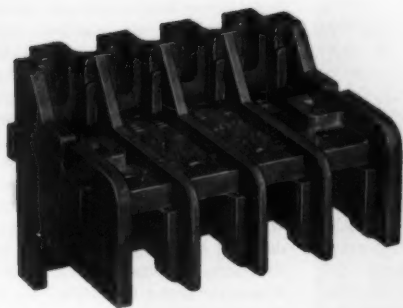
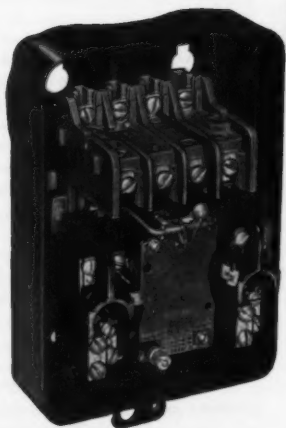
WHILE all the melamine materials have good electrical characteristics, the mineral-filled compound probably heads the list.

As is characteristic of electrical-grade mineral-filled molding compounds, the melamine type must be

* American Cyanamid Co.

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*Terminal boards of Plaskon Alkyd for
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The Furnas Electric Company,
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It all added up to lower manufacturing costs for an improved product when Furnas Electric Company chose Plaskon Alkyd as the molding material for the terminal boards of its Furnas Magnetic Starters. Faster molding with Plaskon Alkyd resulted in time savings of up to 50%. A saving of 25% was realized on the cost of the finished product.

And the high resistance of Plaskon Alkyd to arcing, plus its unusual dielectric strength, mechanical strength, dimensional stability and moisture resistance, helped Furnas to achieve its goal of "a better starter for the money."

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ALKYDS



Courtesy American Cyanamid Co.

Mineral-filled melamine distributor head being tested at 21,000 volts

protected from high humidities. Preforming of large quantities of material for stock is not recommended unless the containers in which the preforms are stored are practically air and moisture tight. When using Melmac 592, it is recommended that only enough preforms for about 4 hr. production should be made, especially if the preforms are exposed to elevated humidities. Serious changes in the electrical characteristics will result from the neglect of this precautionary measure. If, on the other hand, the preforms have picked up a percentage of moisture, it can be satisfactorily removed by pre-drying at 120 to 150° F. just prior to molding.

Mineral-filled melamine has excellent high-frequency preheating characteristics, and once heated to a temperature of 250° F. in any standard high-frequency unit, the material will have a flow sufficiently long for transfer or plunger molding. Such preheating will also aid in compression molding.

Although this material, if properly handled, can be compression molded satisfactorily, this technique is not used extensively because most of the parts which are produced from mineral-filled melamine are quite complicated in structure, entailing molds with fragile pins and other components. For this reason, plunger or transfer molding is used in order to avoid mold breakage due to excessive pressure on weak mold parts. If compression molding is used, the recommended mold temperature is in the neighborhood of 300° F., with a molding pressure varying from 1000 to 6000 p.s.i.

With commercially accepted molds there is little difficulty encountered in transfer or plunger molding of this material. Chrome plating of the mold is recommended, and complete coverage of the surface of the mold is advisable. Certain mold designs sometimes require a deep dead-end channel or tower. With such molds, fouling may be encountered even to the point of having the thin, long molded section break off and stick in the mold. If the broken part will not "mold-out," it will be necessary to remove the die from the press, dig the piece out, and subsequently repolish the mold. Mold fouling is accentuated by the presence of moisture in the material. If fouling continues, and undercuts are not present in the fouled section of the mold, it is recommended that the mold temperature be gradually lowered until the sticking is eliminated. Adequate venting in deep recesses of the mold is also highly recommended. The pot and mold temperature should be between 275 and 340° F., and the plunger or transfer ram pressure will vary over a wide range from 4000 to 20,000 p.s.i.

A phenomenon which is characteristic of this material is that of discoloration due to molding. It has no deleterious effect upon the performance characteristics either from a physical or a chemical standpoint. It may be alleviated somewhat by pre-conditioning (careful pre-drying and preheating) and holding the mold and pot temperature as closely as possible to 290° F. Slow plunger speeds will also aid in stopping discoloration during molding.

Discoloration may sometimes be caused by after-baking but, again, change in appearance has no effect upon the quality of the molded part. After-baking may be undertaken for the following reasons: 1) stabilization of dimensions; 2) improving electrical properties, especially the dissipation factor, dielectric constant, and loss factor; and 3) to obtain a uniformly lighter color.

After-baking should be done in a circulating air oven at temperatures ranging from 170 to 220° F. The length of time, in most cases, can only be determined by actually baking a given piece for various lengths of time ranging up to 6 hours. Heavy-sectioned pieces usually require oven temperatures in the

lower range, whereas thin sections may be subjected to after-bake temperatures of 220° F., but only for relatively short periods of time.

There is no difficulty encountered with this material when inserts are molded in. Best practice dictates, however, that adequate thickness be provided around such inserts.

TETRAFLUOROETHYLENE

by D. B. HANSON*

ZERO water absorption, high impact strength and form stability, and exceptional resistance to chemicals are outstanding properties of Teflon tetrafluoroethylene resin.

Because Teflon tetrafluoroethylene resin does not melt and flow, it is not adapted to molding by conventional techniques used with other plastics. Rather, it is molded by a process roughly comparable to that used in powder metallurgy, which depends on fusion of solid particles that have been compressed into a mass of the desired shape.

Teflon is supplied in the form of a granular powder whose particle size is of the order of 30 to 50 mesh. Upon compression at about 2000 p.s.i., the particles display a remarkable cohesion, and pieces thus preformed hold together well enough to be handled with moderate care. However, even at high temperature, the material does not flow, under ordinary molding pressures, to the extent necessary to fill mold recesses, and if flow is forced by extreme pressure, slippage within the piece produces cracks which do not reweld. The polymer does not reach a fluid condition under high temperature, but at 620° F. it undergoes a transition from the normal crystalline state to an amorphous gel. In the gel state, fusion between particles results in a molded piece of good strength, and this is the factor upon which the molding process depends.

It is well to remember, in specifying dimensions for any article to be

(Continued on p. 151)

* Polychemicals Dept., E. I. du Pont de Nemours & Co., Inc.

New Techniques in Reinforced Plastic

Aluminum molds cast from plaster forms; resin transferred from pot to mold by vacuum plus air pressure

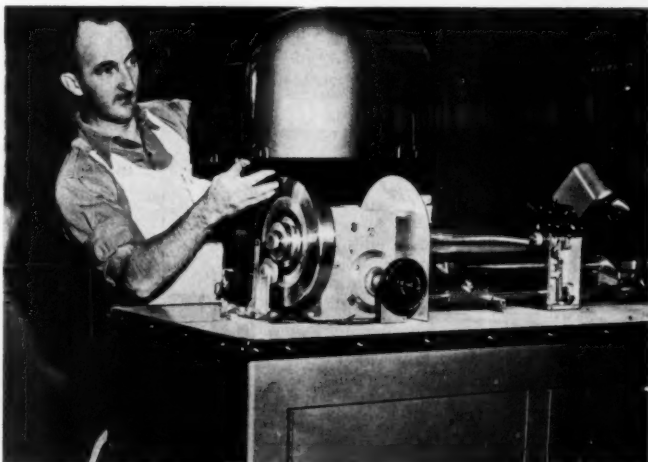
ADoption of Fiberglas-polyester low pressure molded housings for photo-electric engraving machines made by Fairchild Camera and Instrument Corp., Jamaica, N. Y., is saving the manufacturer \$300 to \$500 per month in direct production costs as well as effecting further savings by reducing assembly time.

The aluminum housing which was originally used to protect the machine's component parts, and also to provide electrical shielding, had drawbacks. Welded together of five separate stamped pieces, it was expensive to produce. The metal dented easily. Close tolerances were difficult to maintain and, further, production line adjustments were often necessary.

A short time ago, Le Conte Plastics Co., Babylon, N. Y., was given a contract to produce this housing from Fiberglas mat bonded with a polyester resin. Within one month from the receipt of the order, Le Conte was delivering satisfactory housings to Fairchild. This speedy delivery was made possible because of the fairly simple mold construction required for this type of low pressure molding.

The molds for the plastic housing are made of cast aluminum. A plaster model was first produced by machining a rough plaster cast to accurate dimensions. Accuracy of contour was achieved by using templets cut to the curvatures of the various sections of the part to be molded. After a parting agent was applied to this model, a female form was cast around it in plaster. The original model was then removed from the plaster female mold, and sheets of pattern-makers' wax of a thickness equal to that of the finished housing were tailored to size, shaped, and placed against the inner wall of the female form. The edges of the sheets of wax were very carefully cut so that the abutting

(Continued on p. 92)



Placing the reinforced plastic housing over the electronic mechanism of a photo-electric engraver. A molded-in layer of copper screening provides electrical shielding

Glass fiber mat is cut to size with the aid of an accurate pattern. Layers of mat, with copper screening between, are stapled in shape before final low pressure molding





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In Canada: NORTH AMERICAN CYANAMID LIMITED, Royal Bank Building, Toronto, Ontario, Canada.

Cyanamid looks at

PLASTICS TODAY

...The Closure Field

IT HAPPENED back in the embryonic stage of the plastics era... when every day brought some new idea or disappointment to today's leaders in the plastics industry.

A young executive of what was then a modest-sized firm (now one of the largest) mused about the future of his and other struggling, pioneer companies. He asked himself what could be done to make the future of plastics secure. Then the thought came... "Why not make something everyone uses... and throws away?" But what?

He began to make a list of possibilities, when he remembered a note from his wife—"Buy toothpaste on the way home tonight". There was something—toothpaste caps... used and thrown away! This was the beginning of a perfect replacement market... closures. And today it is one of the biggest markets for thermosetting molding materials.

Last year molders used nearly 20 million pounds of plastics in the production of closures for bottles, cans, jars, tubes and other containers for a tremendous variety of products—from foods and liquors—to cosmetics and medicinals. Much of this production is in thermosets such as BEETLE and the then small producer with his principle of producing something everyone can use and throw away is now one of the leading molders in the industry.

The increasing use of plastics for closures has, in fact, revolutionized the concept of closures and their function. No longer is a bottle cap or jar top considered merely a utility part of a package; it is also a salesman. In many cases it is one of the most profitable salesmen a product has!

During the past twenty years the percentage of closures fabricated from thermosetting (heat hardening) plastics has steadily expanded. This has been due partly to the inherent qualities of thermosetting plastics themselves and greatly to the skill and ingenuity of molders in adapting these qualities to specific closure requirements.

BEETLE, a urea-formaldehyde plastic introduced in 1929, was one of the pioneer compounds in this field. It enjoys increasing demand year after year, because of its unique combination of qualities. Among the qualities that make it a widely specified material for closures are its unlimited range of colors and shades, its smooth and durable surface, its resistance to chemicals, alcohol and essential oils, its lightness of weight and shock resistance, together with absence of taste or odor.

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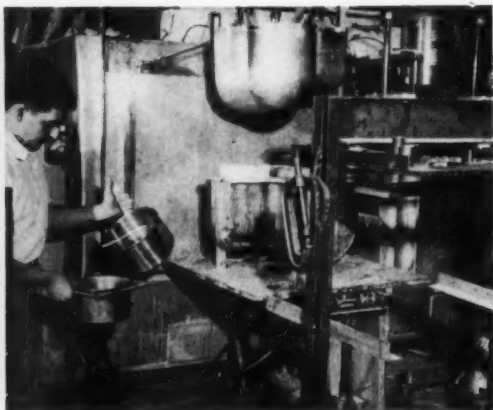
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Sales of DuBarry cosmetics have jumped almost one-third since 1948. That's when this famous line changed its dress to the pastel shade shown here. Closures are molded from BEETLE plastic in the delicate pink that appeals . . . and sells . . . to women.



Placing the shaped lay-up of glass fiber mat and copper screening in the female part of the mold. Male part is suspended above the female



Hose from resin pot is connected to female part of the mold. After pot is filled, provision is made for applying air pressure to the resin

joints of the various pieces matched perfectly. Any imperfections were filled in with a special compound, resulting in a layer of wax of uniform thickness covering the female form.

The next operation was to cast a plaster male form against the pattern-makers' wax. When the two plaster forms were separated and the wax removed from the female, the molder had available a perfect female and male form which were sent to a foundry where aluminum molds were cast from them.

While it is true that this method of mold production requires a number of steps, none of them is time consuming, and hence an accurate mold can be very quickly produced.

Electrical Shielding

Since one of the functions of the housing for the engraver is to shield

the electronic components, it is necessary to provide a metallic medium in the lay-up. For this purpose, a layer of copper screening is incorporated between two layers of Fiberglas mat. Both layers of the mat are cut to a predetermined pattern and, with the copper mesh between them, the sheets are wrapped around a wooden male form similar to the male portion of the mold. Staples are then applied to hold the Fiberglas mats and the copper screening in proper shape for subsequent molding.

Inasmuch as little, if any, pressure is used during molding and because a perfectly smooth surface is required on both sides of the finished housing, it is necessary to inject the resin onto the lay-up after the mold is closed. Le Conte solved this problem neatly by developing a separate resin pot which was con-

nected to a small opening in the mold by a hose. A second connection was made on the resin pot so that air pressure could be exerted against the resin. In addition, a vacuum connection was made on the mold.

Vacuum Plus Pressure

With such a setup, the resin is transferred from the pot into the mold by drawing a vacuum on the mold and simultaneously exerting air pressure on the resin in the pot. By this system the entire mold is filled out with resin, and no difficulty is encountered with starved spots caused by trapped air. As soon as the mold is completely filled out, the vacuum and resin pot connections are broken and the mold placed in an air circulating oven for cure. After molding, the housing is placed on a jig to insure uniform trim and a sawing operation used to finish the parting line.

According to Fairchild, these housings have further advantages in addition to those already mentioned. Because of the dimensional stability of the Fiberglas-polyester material, the housings have more uniform tolerances. Rejects have been practically nil. Virtually no finishing is required, and the installation operations in Fairchild's plant have been simplified. The molded plastic housing is more rugged than the aluminum type which it replaced, and it also has a very high level of dent resistance.



Only finishing operation needed on glass mat-resin housing is a sawing operation on the parting line. Housing is placed on jig to insure uniform trim



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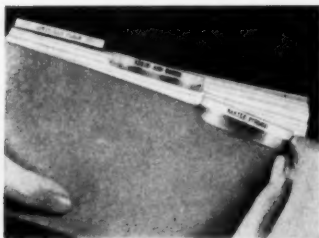
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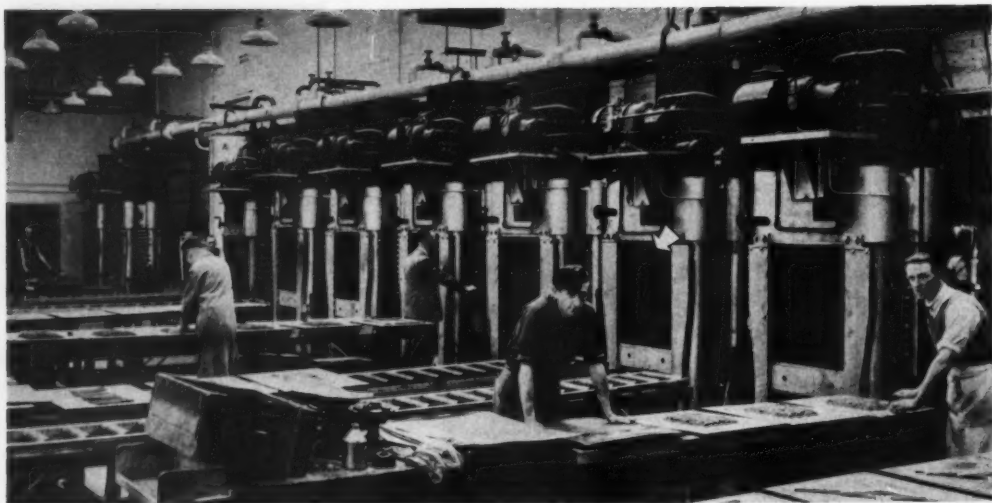
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General view of a battery of multiple-platen casein presses after conversion from accumulator operation to individual pumps. Arrow at second press from the right points to flash between platens. This flash indicates to operator that press cycle is complete

Modernization of A Casein Plant

NOTWITHSTANDING years of experience in the production of casein sheet, its manufacture has remained an art, has never become an exact science. Owing to the varying characteristics in each batch of material, its conversion has always demanded a great degree of manual and visual control. Such control is required mainly because of differences in mold "fill-out" time, the completion of which is visually determined by the appearance of flash.

When heavy maintenance costs and increasing inability to sustain uninterrupted production with an existing accumulator system made modernization an economic necessity, Erinoid Ltd., Stroud, England, found itself in a quandry. The problem was made more urgent by increased production demands which necessitated using additional presses to keep pace with market needs.

In post-war Britain, supply difficulties prevented an all-out "scrap and modernize" plan. But the existing accumulator system in the Erinoid plant did not have sufficient capacity to handle additional presses.

Hence the company was faced with two alternatives; a new accumulator could be bought and connected in series with the old one—after the latter was rebuilt—or the additional presses could be equipped with separate pumps. The decision made was to initiate production tests with self-contained presses equipped with separate pumps and modern valves. So successful have been the tests that casein sheet production in the Erinoid plant has been expanded from eight to 13 presses equipped with individual pumps.

Hydraulic Pump Used

The pump selected for this modernization work was a high-speed straight in line Electraulic pump, manufactured by Towler Bros. (Patents) Ltd., Rodley, Leeds, England. This pump uses a thin mineral oil of about 57 Saybolt at 100° F. as the hydraulic medium and is well suited to casein sheet production because of the wide range of pressures and the satisfactory pumping capacity available.

For fast closing, the Electraulic

pump can deliver 10 imperial gal. of oil at pressures up to 400 p.s.i., with build-up to a maximum high pressure of 7000 p.s.i. if required, with gradual diminishing capacity.

The casein presses in this installation are up-stroking, eight to 10 platen type. The press rams are 18 in. in diameter, and the stroke varies from 18 to 27 in. according to the number of openings. Each platen is 27 in. square, accommodating sheet molds 22 by 18 inches. The maximum thickness of casein sheet that this company can produce is 1 inch. However, 0.630 in. is, so far, the maximum which has been required. Main output consists of 0.157-in. thick sheets, with occasional departures down to 0.079 in., and more frequently up to 0.394 or 0.472 in.

Molding Cycle

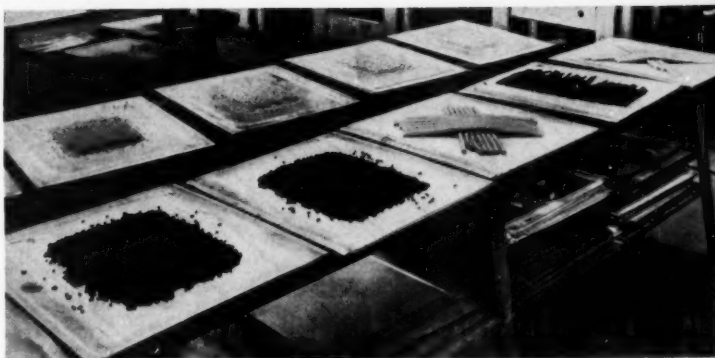
In casein sheet production, the material—extruded rods, extruded bars, or pellets as suited to the required configuration of the sheet—is weighed and loaded into the molds. The molds are then placed in the press, and a lever is thrown to admit

oil under pressure to the ram. After mold closing and "filling-out," pressure is cut off from the ram, circulating hot water is cut off from the cored platens, and cooling water is admitted. The press is then opened and the molds removed.

On these casein presses the closing operation occupies about a minute, after which the pump rapidly builds up pressure to the maximum requirement which varies between 5000 to 5500 p.s.i. The pump, being of the sustained pressure unloading type, cuts out at the required pressure and automatically cuts in again should the pressure on the ram fall below the desired level, thus affecting power consumption economies.

Owing to the great variety of sheet thicknesses and colors worked in the plant each day, completely automatic cycling is not employed; manual-visual control is retained. Cycle times vary from 10 min. in the press for a 0.157-in. thick sheet to 20 min. for 0.630-in., with loading and unloading of the molds requiring an additional 5 minutes.

A reduction in the molding cycle is being effected by the installation of a new hot water system which will

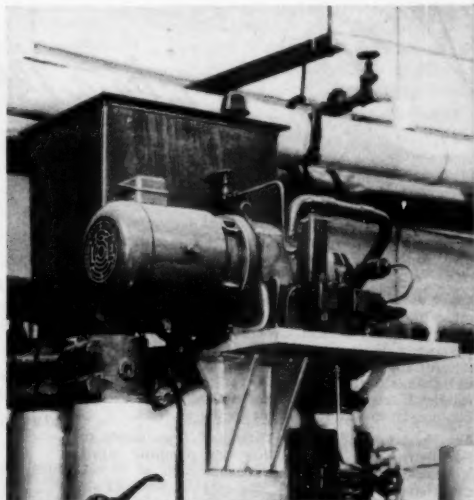
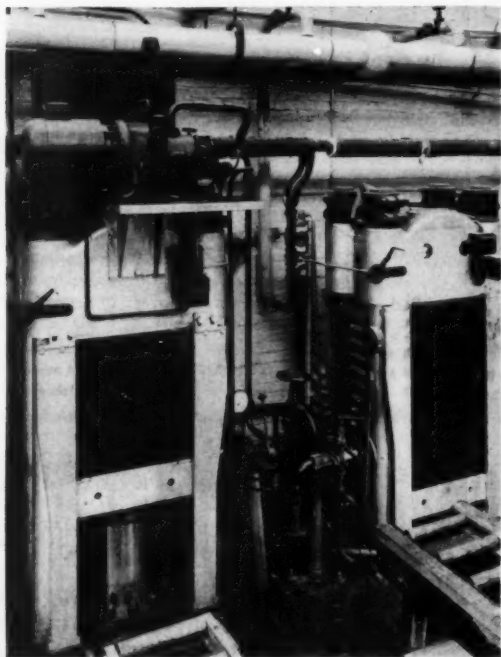


Molds ready for press, loaded with extruded rods, oval bars, or pellets, according to finish required on sheet. Arrangement of material is important in producing correct figure

make possible more runs per hour.

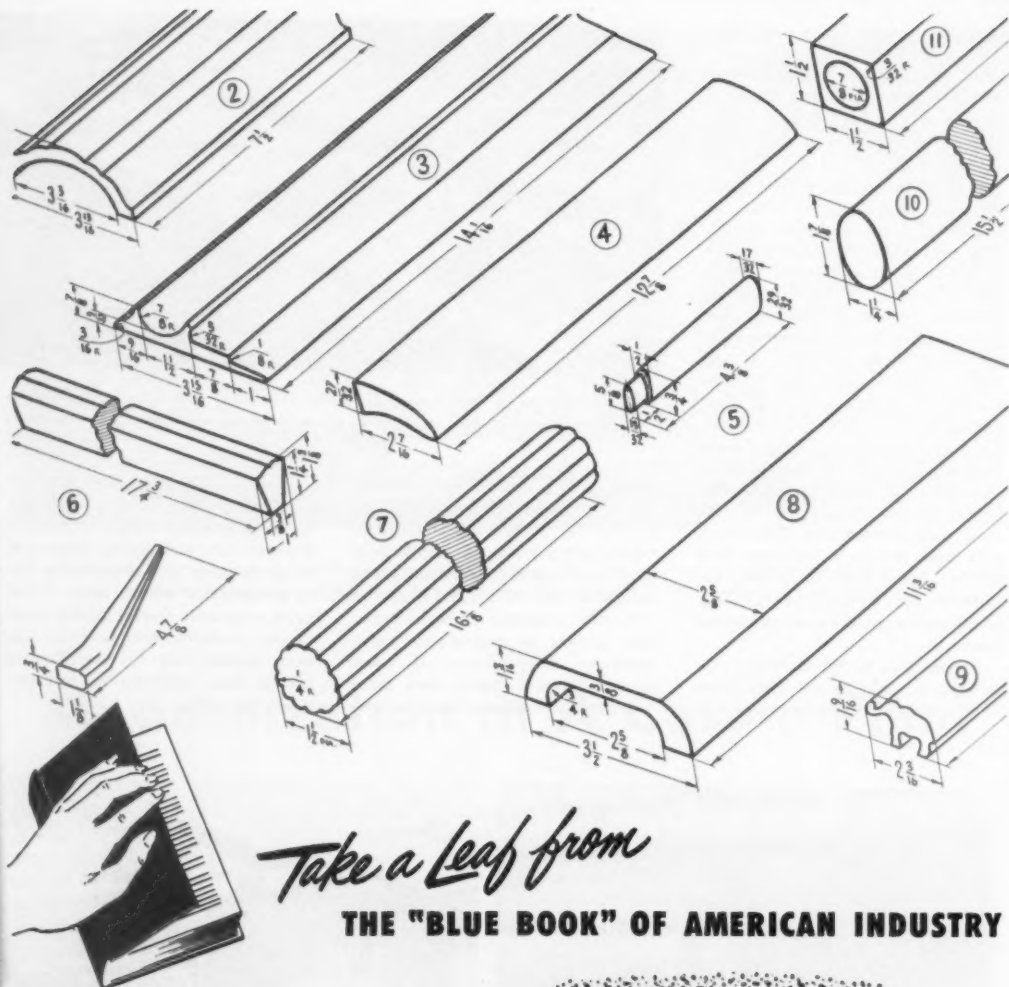
It is of interest to note that the installation of the self-contained Electric pump system in the Erinoid plant has resulted in important gains, compared with the old and worn-out accumulator system. These include a 95% savings in maintenance costs; complete independence of other presses when bringing each press into operation, without danger of los-

ing the "high pressure" through overloading the accumulator; dependable pressure maintenance during each run; and the elimination of complete press shop shut-downs due to accumulator failure. Most of the press conversion and rebuilding work in this modernization program has been carried out by the Erinoid plant's own maintenance and engineering staff.



Above: Close-up of top of casein sheet press, showing the individual pump and its attendant equipment

Left: Only a single control is needed on pump-operated press; other press is accumulator operated



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Residual Strains in Injection Molded Polystyrene[†]

by R. S. SPENCER[‡] and G. D. GILMORE[§]

Three types of residual strain in injection molded pieces are considered: 1) those accompanying quenching stresses; 2) frozen-in molecular orientation; and 3) configurational volume strains. Quenching stresses sometimes relieve themselves by producing bubbles or sink marks in the article, and may be otherwise relieved by annealing. Configurational volume strains can be relieved only by annealing, which is frequently impractical, and are not important in many practical cases. Much of the frozen orientation present originates during "packing," that period of the plunger forward time subsequent to filling. Considerable reduction in the amount of frozen orientation may be effected by minimizing the packing time. This is rendered practical by the use of a mechanical device to seal the mold. Reduction in amount of frozen orientation reduces the tendency of the moldings to "craze," improves the dimensional stability on heating, and produces more consistent specimens for mechanical testing.

In a former paper¹ the authors discussed the sequence of events during an injection molding cycle. Subsequent work has shown how the properties of the molded article, and various defects which may be present, are related to the steps in this sequence of events. The present paper takes up one such topic, the residual strain in the molding, and will discuss: 1) the origin of the different types of residual strains; 2) means of relieving or preventing residual strains; and 3) their effect on crazing and on the mechanical properties of the molding.

Differentiation is made between

three types of residual strains: 1) those accompanying thermal (quenching) stresses; 2) frozen-in molecular orientation; and 3) what might be termed configurational volume strains. To distinguish these properly, and understand their origins, it will be necessary to review briefly the rheological behavior of polystyrene.

Rheological Behavior

Rheology is defined as "the science of the deformation and flow of matter." From this definition it will be realized that the rheological properties of a plastic are a prime consideration in determining its behavior in any type of hot-fabrication operation. The deformation of a plastic such as polystyrene under the action of a suddenly applied load is rather complex. First of all, there is a small

deformation which appears instantly. This is followed by further deformation at a rate which falls off with time. Eventually this levels off, and deformation proceeds at a constant rate, that is, the final deformation-time curve is plotted as a straight line.

Suppose, now, the load is suddenly removed. The deformation decreases instantly by an amount equal to the initial instantaneous deformation. This is followed by a slow recovery of part of the deformation at a continually decreasing rate. Finally, the deformation levels out at a constant value, and this "permanent set" corresponds to the straight-line portion of the original curve (extrapolating to the starting point and deducting this intercept deformation).

Thus it is seen that we need three mechanisms of deformation to explain the behavior of polystyrene. These are usually denoted as: 1) *ordinary elasticity*, which gives rise to instantaneous, recoverable deformation; 2) *high (or rubber-like) elasticity*, which results in retarded, recoverable deformation, and 3) *viscous flow*, which produces time-dependent, non-recoverable deformation.

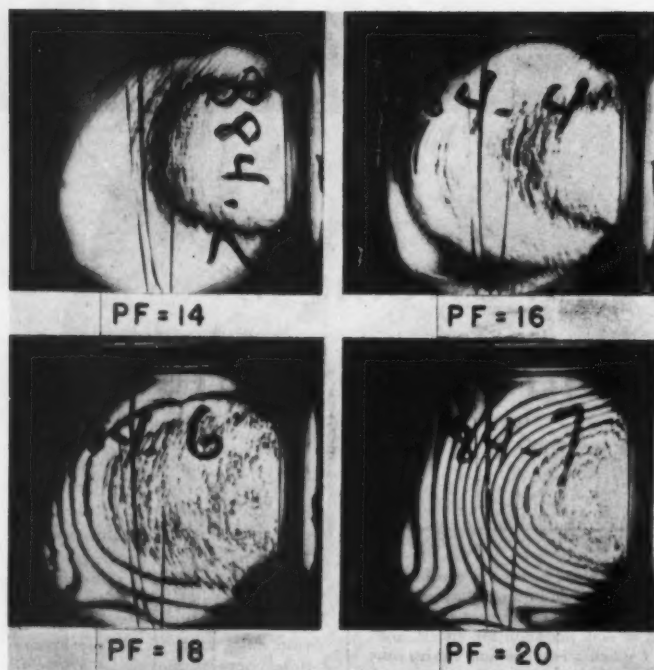
Ordinary elasticity is associated with the bending of valence angles and the stretching of valence bonds, and is very similar to the elasticity of metals. The modulus is high and relatively independent of temperature. It is the predominant mechanism in short-time deformations at

* Reg. U. S. Pat. Office.

[†] Presented at a meeting of the Society of Rheology in New York, November 3-4, 1950.

[‡] The Dow Chemical Co., Midland, Mich. Address all inquiries to E. L. Kropscott, Plastics Technical Service, The Dow Chemical Co., Midland, Mich.

[§] G. D. Gilmore and R. S. Spencer, MODERN PLASTICS 27, 143 (Apr. 1950).

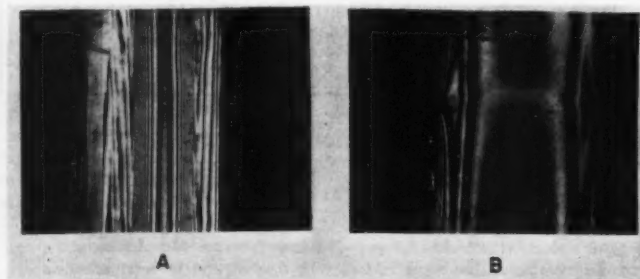


1—Effect of packing on residual strain. Pieces viewed between crossed Polaroids. Gate dimensions: 0.375 by 0.035 inch. As PF rises, amount of frozen orientation increases

room temperature and at lower temperatures.

High elasticity is attributed to the uncoiling of normally coiled-up polymer molecules, as in the stretching of a piece of rubber. The modulus is much lower than that of ordinary elasticity, and is relatively independent of temperature in the case of polystyrene. The time factor is very strongly dependent upon temperature, however. High elasticity becomes an important consideration at around the softening point, and has become almost instantaneous by the time typical molding or extrusion temperatures are reached. The important things to remember about this deformation mechanism are that it results in a stretching out and orienting of the molecules in the direction of stress, and that the rate of deformation is very temperature-sensitive.

The third mechanism, viscous flow, involves the movement of entire molecules with respect to each other. The viscosity of a molten plastic is a very important property in the study



2—Cross-sections of boxes viewed between crossed Polaroids: A) near weld; B) at weld with line of sight parallel to box wall planes, perpendicular to polymer flow direction

of injection molding, but is not of immediate interest in discussing residual strains. Little more need be said at this point.

Another important quantity associated with the rheological properties is the softening point. This may be defined in various ways by specifying testing procedures, but it is usually in the same neighborhood as the heat distortion and transition temperatures. A number of the proper-

ties of the plastic change very rapidly as it passes through the softening point, such as the thermal expansion coefficient, specific heat, tensile strength, superficial modulus, etc. It is well to keep in mind, however, that the softening point of a plastic is very different in nature from the melting point of a crystalline solid, in that it is dependent upon the time scale of observation.

Suppose, for example, that a periodic stress were being applied to a plastic sample and the superficial modulus determined. At high temperatures this modulus would be almost constant and correspond to that of high elasticity. As the temperature decreased and passed through the softening point the modulus would rise rather abruptly and approach the much higher value for ordinary elasticity. For all practical purposes, the plastic appears to "set up" over a fairly narrow temperature range, and one might be tempted to draw analogies with the freezing of an impure liquid. However, an important difference is to be noted. If we were to change the frequency of our periodic loading, the softening temperature would shift accordingly, since it relies on time scale of observation.

As a plastic is cooled through the softening point the molecular chains become less and less mobile. This has effects in addition to those noted above. For example, the volume of a given weight of plastic decreases as it is cooled. This seems to be due to two causes: the molecules draw closer together, and the configuration of the molecules becomes more compact. Above the softening point both processes can operate easily;



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below the softening point the molecules are so immobile that they cannot move into their new configurations, and the volume is greater than it should be. Since this apparent immobilization is really a rate effect, it is not too surprising to note that a quenched sample will slowly shrink over a long period of time and ultimately reach a stable volume. In the case of polystyrenes which contain very little extremely low molecular weight material, the rate of shrinkage at room temperature may be so low as to be of no consequence. It was this phenomenon to which reference was made earlier in speaking of configurational volume strains.

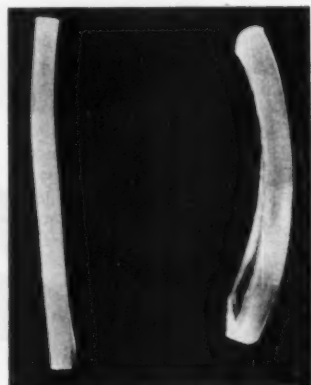
It has been pointed out many times that when a system containing asymmetrical particles flows, the particles become partially oriented in the direction of flow. In a material like polystyrene this effect manifests itself as a partial uncoiling of the molecules and alignment of their longer axes with the direction of flow. That is to say, even when the plastic flows quite readily, there is still the possibility of considerable highly elastic deformation. If the stress-producing flow is removed while the plastic is still relatively hot, the chains coil up very rapidly and the orientation disappears. If, on the other hand, the material is cooled to the softening point while the stress

and many other points may be found by referring to the literature.²

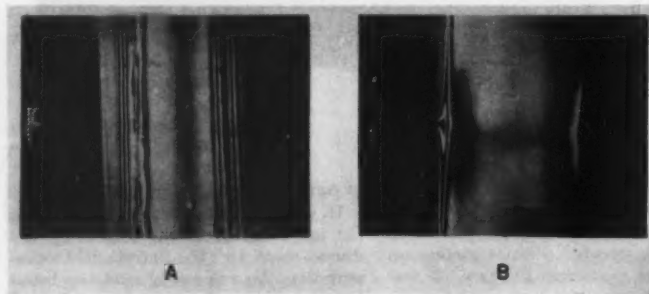
Quenching Stresses

Residual stresses are commonly found in samples of materials which have been cooled more or less rapidly through their freezing points or hardening ranges. The origin of such residual stresses is easily understood. At the instant the outer surface of the body first reaches the freezing point, the stresses acting can be only hydrostatic. A short time later a shell of frozen, rigid material has formed, containing within itself a region of hotter, still fluid material. Further cooling of the central region results in a negative hydrostatic stress and corresponding compressive tangential stresses in the rigid shell. This situation will persist, under certain conditions, even when thermal equilibrium has been attained, leaving balanced residual stresses in the body at room temperature. The magnitude of the residual stresses may be reduced by slowing down the process of cooling during the time hardening is taking place throughout the body. This annealing procedure decreases the temperature differences present during hardening, and thus reduces the residual stresses. In general, annealing to minimize quenching stresses has little practical application during injection molding. How-

In many cases, the equilibrium between the negative hydrostatic stress and the compressive tangential stress is unstable, and either the shell collapses in some way or a vacuum bubble is formed in the center of the body. In injection molding the hot



4—Pieces cut from box and relaxed at 230° F. Left: Shrinkage of oriented layer is evident in first tab. Right: Surface layer machined off before relaxing



3—Box cross-sections viewed between crossed Polaroids: A) near gate; B) at weld. Photo differs from Fig. 2 only in that pieces were made in shorter plunger forward time

is still acting, the chains are immobilized in the uncoiled state and we find that frozen orientation is present in the plastic.

This discussion of the rheological properties of polystyrene has been, of necessity, very qualitative and undetailed. Further details on these,

ever, annealing of the finished articles may be feasible in some cases, and procedures have been suggested for accomplishing it.³

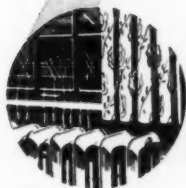
² Recent general references include T. Alfrey, Jr., "Mechanical Behavior of High Polymers," Interscience, New York (1946) and R. S. Spencer, chapter in a forthcoming ACS Monograph on Styrene and Polystyrene.

³ J. Bailey, MODERN PLASTICS 24, 127 (Oct. 1946).

plastic is injected into the cold mold cavity, subjected to a hydrostatic pressure, and left to cool under conditions of substantially constant volume. The hydrostatic pressure will drop as cooling proceeds, in a manner which has been described.¹ At some point in the cooling process the pressure reaches zero, and further cooling develops negative pressures inside the rigid shell which has been formed. The location of this zero-pressure point is an index to the further behavior of the piece during cooling. If it falls in the earlier stages of cooling, the shell will not be sufficiently thick to support the ensuing stress and it will collapse in some spot. The resulting defect in the molded article is commonly referred to as a "sink mark." If the zero-pressure point lies in the intermediate stage of cooling, the shell will support stress but the center will still be hot enough to permit the formation of vacuum bubbles. If the zero-pressure point is deferred to the later stages of cooling, neither of these defects forms, and the resulting molded article consequently contains quenching stresses.

Thus it is seen that the steps in the

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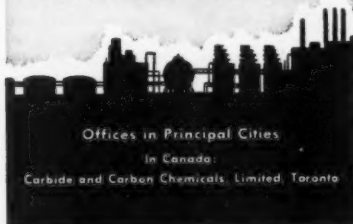


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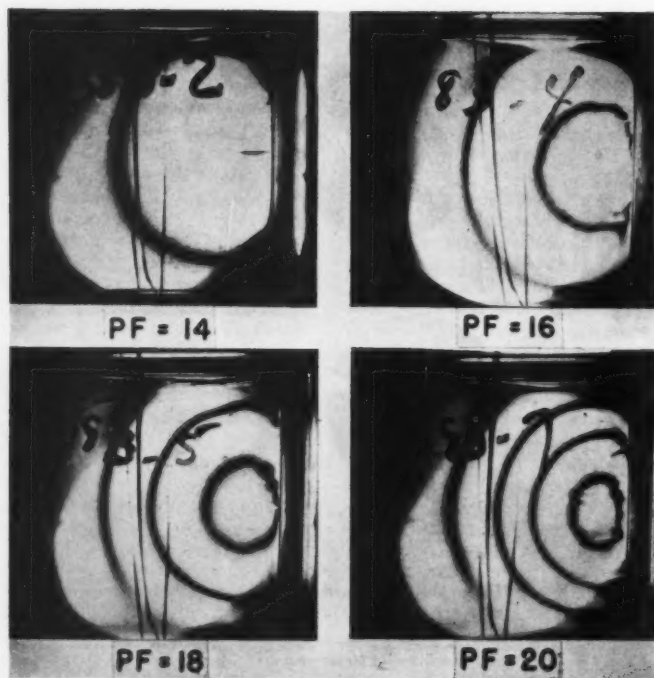
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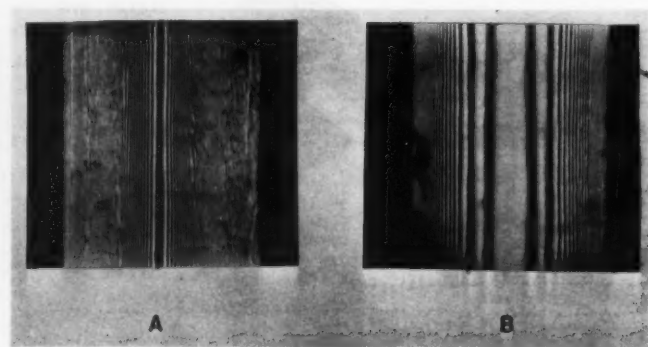


5—Effect of packing on residual strain, using restricted gate to prepare moldings at different plunger forward times. Gate dimensions were 0.020 by 0.030 by 0.080 inch land

progression sink marks → bubbles → satisfactory pieces are but different stages in the same process. Experience shows that this is strictly true only for pieces with relatively thick sections; pieces with only thin sections do not customarily show bubble formation. In either case, we can say that the way to reduce or eliminate sink marks or bubbles is to move the zero-pressure point to a later stage of cooling. This can be done in several ways: by increasing the plunger forward time, lowering the temperature of the hot plastic, or making the gate (entrance to the mold cavity) smaller. Of these, the first method is probably the simplest and most generally used.

Configurational Volume Strains

What we are calling configurational volume strains are of only slight practical significance in injection molding, and are mentioned principally for the sake of completeness. They are among those phenomena associated with the apparent second-order transitions of plastics.



6—Cross-sections of a television lens viewed between crossed Polaroids: A) normal molding; B) mold sealed by positive mechanical shutoff at end of plunger forward time

Little need be added at this point to what was said in the section on rheological behavior; more detailed information may be found in the existing literature.⁴

As might be expected, this type of residual strain can be reduced by an annealing procedure. Calculation of

⁴ R. S. Spencer, *J. Colloid Sci.* 4, 229 (1949).

the annealing schedules required, however, shows that this is impractical in most cases.⁴

Frozen Orientation

It has been mentioned that the flow of hot polymer is accompanied by a partial uncoiling and orienting of the chain-like molecules in the direction of flow. If the polymer is cooled below the softening point while in this state, the orientation is frozen in. Simultaneous flow and cooling occur during three steps of the injection molding cycle: filling, packing, and discharge.

Filling is usually a relatively rapid process during which cooling is not very extensive, being ordinarily only enough to form a thin skin of cold plastic. (Exception must be taken to this, of course, for those cases in which the molding contains very thin sections.) Thus, while some orientation is frozen in during filling, this is confined to the skin of the molding, and is not the predominating factor.

Packing proceeds during that portion of the plunger forward time which is subsequent to filling. There is a somewhat slower flow of polymer during packing, but the time allowed for this portion of the cycle is usually

long enough to permit considerable cooling. It is our feeling that this factor is important enough to justify saying that a greater portion of the frozen orientation present in conventional moldings is formed during packing.


Discharge, like filling, occurs during a relatively short time interval.

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● Dazey juicer manufactured by Dazey Corp., St. Louis, Mo. Bowl, strainer, reamer, and knobs molded by Michigan Molded Plastics, Dexter, Mich.

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● Information regarding Tenite is also obtainable through representatives located in Chicago, Cleveland, Dayton, Detroit, Leominster (Mass.), Los Angeles, New York, Portland (Ore.), Rochester (N. Y.), St. Louis, San Francisco, and Seattle; and elsewhere throughout the world from Eastman Kodak Company affiliates and distributors.

This takes place during later stages of cooling than packing, hence the cooling process is slower. Both of these factors diminish the contribution of discharge to frozen orientation.

These points are illustrated in Fig. 1. Moldings were prepared at different plunger forward times, other conditions being constant. The resulting pieces were examined between crossed Polaroids with monochromatic light. In Fig. 1 the direction of observation is parallel to the direction of heat flow; thus quenching stresses need not be considered, and the observed patterns can be associated with frozen orientation. It may be seen that the amount of frozen orientation increases markedly with increasing packing, and seems to approach very nearly zero as the packing approaches zero. It should be mentioned at this point that most of this preliminary work was done using the box mold previously described.¹

Cross-sections of the box wall were taken near the gate and at the

lar to the direction of polymer flow. Typical examples are illustrated in Fig. 2, page 98.

Several distinctive features may be noted. As might be expected, some of the frozen strain is concentrated in a sort of surface skin, which is

Table I.—Effect of Frozen Orientation on Flexural Strength

Sealing method	Flexural strength ^a	
	Parallel to flow	Perpendicular to flow
	p.s.i.	p.s.i.
Freezing in gate	16,200	6300
Mechanical seal	15,700	6700

^a Each value is the average of three determinations.

present in both cross-sections and presumably elsewhere throughout the molding. It seems likely that a sizeable amount of the orientation frozen into this skin may be associated with the filling step. Inside this thin skin we have a thicker layer in which the orientation was frozen during packing. This packing orientation is present in the gate cross-section, but absent in the weld cross-section. This is not too surprising when it is realized that the rate of polymer flow during packing is a maximum at the gate and drops off to zero at the weld line. As a further point of interest, the strain pattern clearly shows the location of the weld and the conditions existing at that point.

In Fig. 3 a similar cross-section near the gate is shown for a case in which the packing time was appreciably shorter. The reduction in frozen strain is apparent.

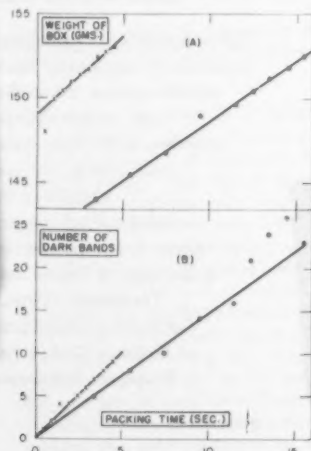
The concentration of frozen orientation in a surface layer at each side of the box wall may be illustrated further by cutting tabs similar to the cross-sections just discussed and relaxing the orientation in an air oven at 230° F. Typical samples are shown in Fig. 4. Shrinkage of the oriented layer is quite evident in the first tab shown. Machining off this oriented layer before heating greatly reduced warpage of the tab. Going to a shorter packing time during molding had a similar, although less extreme, effect.

It has been pointed out that frozen orientation may be substantially re-

duced by minimizing the packing time. With conventional molds and presses this procedure cannot be carried far enough to be of much benefit. As the packing time is reduced, discharge becomes more extensive and less plastic is sealed into the mold (see reference 1.) This leads to the formation of sink marks or bubbles, because the zero-pressure point is shifted to an earlier stage of cooling. From this it is apparent that extensive reduction of the packing time will become feasible only if a means is provided to reduce or eliminate discharge.

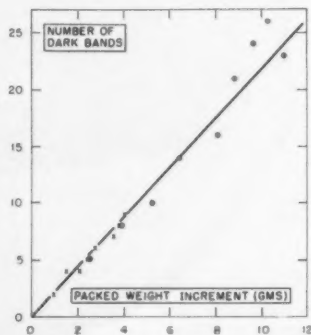
One method used in the past for reducing discharge is to go over to a restricted (or pin point) gate. This speeds up sealing of the mold, cuts down on discharge, and hence seals more pressure in the mold. A restricted gate was used to prepare a series of moldings at different plunger forward times, comparable with the series in Fig. 1. The strain patterns of the resulting pieces are shown in Fig. 5, and should be compared with those of Fig. 1.

The use of the restricted gate is accompanied by certain disadvantages, in addition to which it is only a partial solution to the frozen orientation problem. A better answer seems to be to use some kind of positive me-



7—Influence of packing on weight of molded piece and strain pattern. Circles are normal molding; crosses indicate mechanical seal which provides pieces with less frozen orientation

weld line on the opposite side of the box. These were examined between crossed Polaroids, as before, with the line of observation being parallel to the box wall planes and perpendicu-



8—Dependence of frozen orientation on packed weight increment. Number of dark bands was independent of normal (circles) or mechanical (crosses) sealing

chanical shutoff for sealing the mold at the end of the plunger forward time. In this way discharge can be completely eliminated and the packing time cut back to the point where

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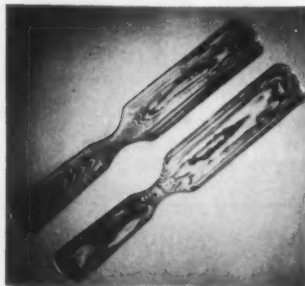
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substantial reduction in frozen orientation is possible. In a typical example of what can be done in this way, moldings of comparable quality were made with and without a mechanical sealing device. Looking at



9—Brush backs—manufactured in the normal manner and with the mechanical seal—as observed between crossed Polaroids

the pieces perpendicularly to one of the box walls, between Polaroids, the strain pattern of the conventional molding was found to contain 18 dark bands in a given distance, whereas the one made with the mechanical sealing device contained only two dark bands in the same distance. Another example is provided in Fig. 6, where cross-sections of a television lens, observed near the gate, are illustrated.

The function of the mechanical seal is illustrated more graphically in Fig. 7. A series of moldings were prepared at different plunger forward times, with and without the mechanical seal. The weights of the moldings were determined and the number of dark bands in a given area of the strain pattern noted. In a series such as this one, the weight of the molding provides an index to quality insofar as sink marks are concerned. In Fig. 7 we see that the mechanical seal gives us moldings of a given quality (weight) at a shorter plunger forward time than in conventional molding, and hence gives us pieces with less frozen orientation. It is interesting to note that the amount of frozen orientation is determined primarily by the amount of plastic "packed" into the piece. The box weights of Fig. 7 may be extrapolated to zero packing time and the intercepts determined for each case. Deducting the correspond-

ing intercept weight from the box weight at any packing time gives the amount of plastic which was added to the box by packing. In Fig. 8 it may be seen that the number of dark bands is directly proportional to this "packed" weight increment, independent of the manner in which the mold was sealed.

The mechanical seal has been tried out with a number of production molds in addition to the experimental box mold used in the above work. In every case it has functioned in the manner already described. One example is shown in Fig. 9, where we see polystyrene brush backs made with and without the mechanical seal. The difference in frozen orientation present in these samples is readily apparent.

Effects of Frozen Orientation

One very important phenomenon observed in molded articles, which is at least partially associated with frozen orientation, is crazing. By this term is meant the formation of numerous small cracks in the plastic, usually extending only part way into the material. Crazing may be brought about in many ways, but it seems reasonable that in any event it is always produced by tensile stresses. It is also generally observed that the craze planes are perpendicular to

in use may arise from various causes. Sudden chilling will result in tension in the surface of the article in all directions. Long time shrinkage which is opposed by the geometry of the article can also lead to tensile



10—Crazing of a box which has been used for several months as a refrigerator dish. Cracks follow the lines of flow

stresses. If the local stress (or strain according to Maxwell and Rahm) is high enough, a craze crack forms. It is known that orientation reduces crazing in tension parallel to the molecules, and facilitates it in tension perpendicular to them. This is associated, no doubt, with the fact that orientation raises the tensile strength along the orientation axis and lowers it across the axis. In the case of two-dimensional tension, as in quenching, one would therefore expect the craze planes to be parallel to the direction of the polymer flow. This is illustrated in Fig. 10, which is a photograph of a polystyrene box which had seen household use for several months as a refrigerator dish. On all sides of the box the craze cracks follow the flow lines.

Temperature cycling may be used as an accelerated test for crazing. Fig. 11 shows two brushes that were quenched in a bath at -94°F ., having been initially at 140°F . The brush back that had been made by conventional molding procedure with a plunger forward time of 25 sec. cracked in several places as a result of the quenching. The brush back that had less frozen orientation because of being made with the mechanical seal at a plunger forward

Table II.—Effect of Frozen Orientation on Reproducibility of Tensile Strength Tests

Quantity	Freezing in gate	Mechanical seal
	p.s.i.	p.s.i.
Average tensile strength	6770	6530
Standard deviation*	320	160
Highest value	7168	6784
Lowest value	5680	5760

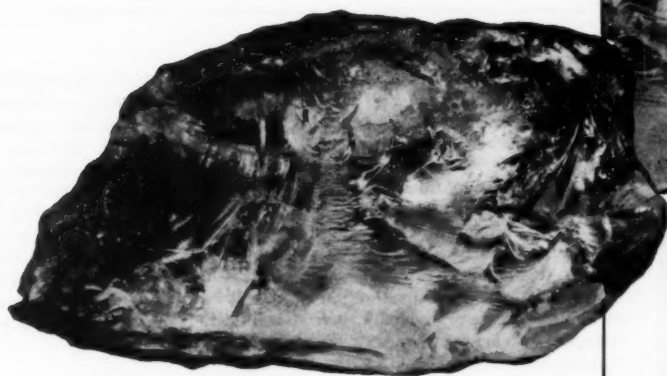
* Each set of data consisted of tensile strength values determined for 45 specimens.

the stress. Maxwell and Rahm⁶ found that, in tensile creep, crazing started in polystyrene at a critical elongation of 0.74%, independent of temperature or time of loading.

The stresses which produce crazing

⁶ Bryce Maxwell and L. F. Rahm, Ind. Eng. Chem., 41, 1988 (1949).

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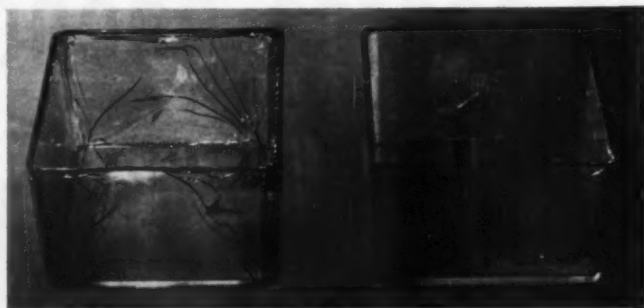
time of only 6 sec. did not crack.

Attack by solvent is another way of accelerating crazing. Bailey⁵ suggested testing for frozen strains by immersing the piece in kerosene for 1 min., removing without wiping, and inspecting for cracks at the end of 30 minutes. Our boxes made in the usual manner showed cracks at the conclusion of this test, whereas boxes of equal quality made with the mechanical seal did not crack. An extreme case is shown in Fig. 12. Two boxes were prepared, with and without the mechanical seal. Examination between crossed Polaroids showed a considerable difference in the amount of frozen orientation present. The boxes were filled with kerosene and observed over a period of time. After 15 min. a crack appeared in the box with the greater amount of frozen orientation. The box made with the mechanical seal did not crack until after 5 days of continuous exposure to kerosene. Figure 12 shows the boxes after six days of exposure.

It has been shown that increasing orientation lowers the softening point of polystyrene.⁶ It might be expected, then, that reducing frozen orientation

examined, the temperature of the bath raised 2° F., and the cycle repeated. The bath temperature which first produced signs of distortion was taken as a sort of "practical" heat distortion temperature. This value

probably of little consequence in production molding, but certainly should be considered in molding test specimens. To show the magnitude of the effect, 90 standard A.S.T.M. tensile test specimens were molded, half



12—Cracking by immersion in kerosene after six days of exposure. The box on the left was made in the normal manner, while the one at right was produced with mechanical seal

was 196° F. for the box made in the conventional manner, and 204° F. for the one with less frozen orientation.

Mention has been made of the fact that the tensile strength of polystyrene is influenced by frozen orientation. This observation applies equally well to other mechanical properties. Flexural strength was chosen to illustrate this point, as being perhaps more surface-sensitive than tensile strength and more reproducible than impact. As before, boxes were molded with and without the mechanical seal and specimens cut both parallel and perpendicular to the plastic flow direction. Table I presents some of the results. The most striking feature is the large difference between the flexural strengths in the two directions. This indicates the presence of considerable frozen orientation in the surface of the moldings. Use of the mechanical seal reduces the difference between the flexural strengths, but not very markedly. This emphasizes the fact that the frozen orientation due to packing is not at the surface, but inside the layer of oriented material formed during filling.

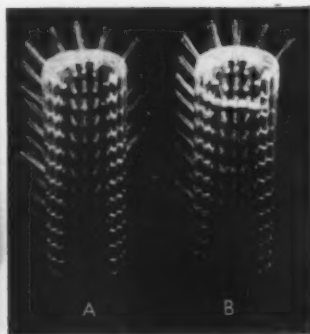
A certain degree of variation of actual molding conditions seems to be almost unavoidable in current practice. This leads to a variation in frozen orientation from one piece to the next which must be reflected in the mechanical properties. This is

with and half without the mechanical seal. Tensile strengths were determined and averages and standard deviations computed, as shown in Table II. Here it may be seen that reducing the frozen orientation reduced the tensile strength only slightly but dropped the variation in tensile strength to half its usual value. This improvement in reproducibility should be given careful consideration in designing mechanical testing procedures.

Applications and Limitations

Many of the applications of residual strain reduction are apparent from the preceding section. One of the most important, insofar as polystyrene is concerned, is the reduction of crazing in articles which are subjected to thermal shocks or exposure to organic solvents, as in paints or lacquers. In some critical applications the elevation of the distortion temperature may be enough to justify strain reduction. In the whole field of optical parts, residual strain is such a factor that even more elaborate procedures than those outlined here may be required. Finally, we wish to emphasize the desirability of residual strain reduction in specimens molded for testing. In some cases, frozen orientation may lead only to an enhanced dispersion of values, as with tensile and flexural strength. In other cases,

(Continued on page 155)



11—Brushes quenched from +140° F. to -94° F. A) mechanical seal at plunger forward time of 6 sec.; B) normal molding at plunger forward time of 25 sec. Note the cracks between holes in B

in a molded article would improve its dimensional stability on heating. This was found to be the case. Boxes were molded in the usual fashion and with the mechanical seal. Representative boxes were immersed in a water bath for 2 min., removed and

⁶ F. H. Müller, *Wissenschaftliche Veröffentlichungen aus den Siemens Werken* 29, 110 (1940); L. E. Nielsen and R. Buchdahl, *J. Applied Physics* 21, 468 (1950).

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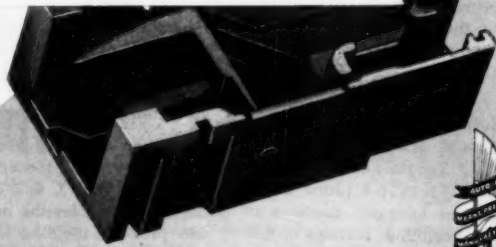
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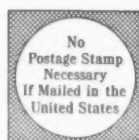
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Attack by solvent is another way of accelerating crazing. Bailey³ suggested testing for frozen strains by immersing the piece in kerosene for 1 min., removing without wiping, and inspecting for cracks at the end of 30 minutes. Our boxer⁴ in the usual manner showed the conclusion of this test of equal quality made. The mechanical seal did not. The extreme case is shown in Figure 11. Boxes were prepared out of the mechanical seal between crossed Polaroids. A considerable difference in frozen orientation was observed over a period of 15 min. a crack appeared with the greater anisotropy. The box with the mechanical seal did not crack after 5 days of contact with kerosene. Figure 12 shows boxes after six days.

It has been shown that orientation lowers the strength of polystyrene.⁵ It is then, that reducing

examined, the temperature of the bath raised 2° F., and the cycle repeated. The bath temperature which first produced signs of distortion was taken as a sort of "practical" heat distortion temperature. This value

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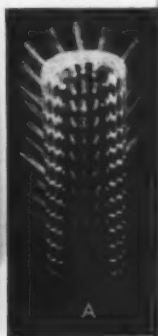
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11—Brushes quenched from 94° F. A) mechanical seal at plunger forward time of 6 sec.; B) normal molding at plunger forward time of 25 sec. Note the cracks between holes in B

in a molded article would improve its dimensional stability on heating. This was found to be the case. Boxes were molded in the usual fashion and with the mechanical seal. Representative boxes were immersed in a water bath for 2 min., removed and

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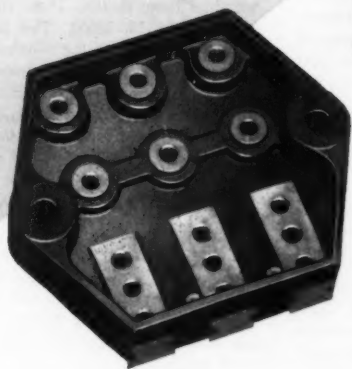
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(Continued on page 155)

³ F. H. Müller, Wissenschaftliche Veröffentlichungen aus den Siemens Werken 20, 110 (1940); L. E. Nielsen and R. Buchdahl, J. Applied Physics 31, 488 (1950).

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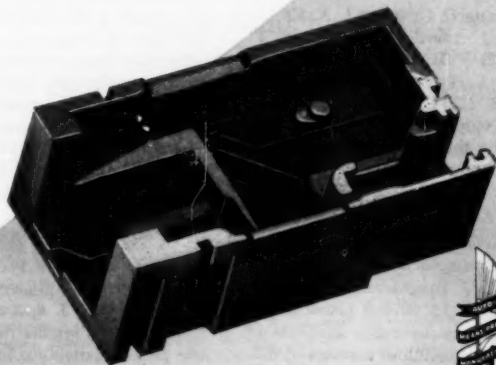
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THE DEVELOPMENT OF THERMOPLASTICS. V. E. Yarsley and A. K. Unsworth. *Brit. Plastics* 23, 23-31 (July 1950). The history of thermoplastics and developments in this field in Great Britain are reviewed.

A SHORT HISTORY OF THERMOSETTING MOLDING MATERIALS. C. A. Redfern. *Brit. Plastics* 23, 16-22 (July 1950). The history of thermosetting molding materials together with outstanding developments, particularly in Great Britain, is described.

PROGRESS IN THE THEORY OF HIGH POLYMERS. N. J. L. Megson. *Brit. Plastics* 23, 39-42 (July 1950). The present status of fundamental scientific theory in the field of high polymers is reviewed.

Materials

FLUOROCARBON RESINS APPRAISED. A. E. Javitz. *Electrical Manuf.* 46, 76-82, 180, 182, 184 (Aug.) and 80-5, 184, 186, 188, 190, 192, 194, 196, 198, 200 (Sept. 1950). The properties and applications of polytetrafluoroethylene and polymonochlorotrifluoroethylene are described in detail. These plastics are mostly used when high thermal stability and good electrical insulating qualities are needed. 27 references.

VINYLDIENE CYANIDE. I. A. E. Ardis, S. J. Averill, H. Gilbert, F. F. Miller, R. F. Schmidt, F. D. Stewart, and H. L. Trumbull. *J. Am. Chem. Soc.* 72, 1305-7 (Mar. 1950). Monomeric vinylidene cyanide is prepared by the pyrolysis of 1, 1, 3, 3-tetracyanopropane. Its thermal polymerization yields a hard, glassy resin.

PRIMARY HYDROXYL GROUPS IN HYDROLYZED CELLULOSE ACETATE. C. J. Malm, L. J. Tanghe and B. C. Laird. *J. A. C. S.* 72, 2674-8 (June 1950). The primary hydroxyl contents of hydrolyzed cellulose acetates of dif-

ferent acetyl contents were determined by reaction with trityl chloride. The percentage of primary hydroxyl is influenced by the amount of water in the hydrolysis bath. An increase in water concentration gives an increase in percentage of primary hydroxyl. The percentage of primary hydroxyl is not affected by the temperature, or by the amount and nature of the catalyst during the hydrolysis. The amount of sulfuric acid catalyst in the esterification influences the percentage of primary hydroxyl in the early part of the hydrolysis.

RESINS GRAZE SUPPLY CEILING. *Chem. Ind.* 66, 499-500 (April 1950). Expansion in the production of vinyl, phenolic, styrene, and alkyd resins is retarded because of limited supplies of benzene, chlorine, and glycerine.

NEWER SYNTHETIC FIBERS. W. P. ter Horst. *Chem. Ind.* 66, 521-6 (Apr. 1950). The properties, production, and prospects of synthetic fibers are described. Fibers made of nylon, polyethylene, polyvinyl chloride acetate, saran, polyacrylonitrile, glycol terephthalate, alginate, carboxymethylcellulose, casein, peanut protein, and zein are considered.

STABILIZERS FOR VINYL MATERIALS. *Brit. Plastics* 23, 70-2 (Aug. 1950.) The types of compounds used as stabilizers for vinyl plastics include lead, calcium, cadmium, strontium, barium, tin, sodium, potassium and organic compounds. No ideal stabilizer is available, but a number of those described are reported to be satisfactory in many respects.

Molding and Fabricating

TOOLING AND RAW MATERIALS FOR LOW PRESSURE MOLDING. R. C. Bartlett, *S.P.E. J.* 6, 5-8, 12 (Sept. 1950). Tooling for the production of low pressure molding includes that used for the no-pressure process,

the matched-mold technique, and the bag-molding technique. The raw materials used are alkyd resins extended with styrene or pigments. Fillers include glass fiber and sisal fiber.

COLD-CASTING MEDICAL SPECIMENS. *Brit. Plastics* 23, 66-66a (Aug. 1950). The internal casting of medical specimens with polyester resins is described. In this process the specimen is used as the mold. Cold-setting resins are used.

TWENTY-ONE YEARS OF MOLDING TECHNIQUES. J. S. Walker. *Brit. Plastics* 23, 32-8 (July 1950). Developments in molding equipment and techniques since 1929 are reviewed.

Applications

POLYTHENE FOIL IN CHEMICAL PLANT CONSTRUCTION. F. R. Hims-worth. *Chem. & Ind.* 1950, No. 28, 555-7 (July 15, 1950). The use of polyethylene film in the construction of chemical equipment is described. It is useful because of its outstanding chemical resistance. Since no good adhesives are known, joints are made by heat sealing. Several applications including methods of construction and heat sealing are described here.

COATING WITH POLYTHENE. *Brit. Plastics* 23, 56-9 (Aug. 1950). Metals, paper, and fabric are coated with polyethylene by flame spraying, cold powder spraying, and dipping techniques.

Properties

FUNDAMENTALS OF ADHESION. G. M. Kline and F. W. Reinhart. *Mechanical Eng.* 72, 717-22 (Sept. 1950). The most significant factor in adhesion is the molecular attraction operative between the adherend and the adhesive. There are many physical factors which affect the strength of a bond by determining the closeness of contact of the adherend and the adhesive, by altering the surface area involved, or by influencing the stress conditions in the joint either as initially formed or under external loading. Although some of the strength of a bond between an adhesive and a porous surface can be attributed to tendrils of adhesive which enter the pores, this mechanical interpenetration cannot account for more than a small fraction of the
(Continued on page 113)

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No. 5013—This phenol varnish produces paper laminates with 35,000 to 40,000 lbs. tensile strength at 150 to 250 psi. It is also in demand for paper face sheeting and bag molding, and in the manufacture of plastic-faced plywood.

No. 5030—A cresol-base laminating varnish for applications requiring the best electrical and mechanical properties. Meets specifications for all NEMA grades except punching stock.

No. 5031—A cresol-base laminating varnish especially developed for the manufacture of hot-punching stock. Produces paper laminates featuring dielectric strength and low power factor.

No. 5033—A cresol-base varnish for use in the manufacture of laminated cold-punching stock.

No. 5036—A cresol-base laminating varnish for manufacturing hot-punching stock meeting NEMA specifications for XXP and XXXP grade materials.

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joint strength. Evidence has accumulated from many pertinent fields which indicates that molecular attractive forces are primarily responsible for the bond between any two surfaces. The types of chemical bonds involved in specific adhesion are reviewed in this paper; followed by a discussion of various physical factors which affect bond strengths. 69 references.

THE DIELECTRIC PROPERTIES OF POLYETHYLENE TEREPHTHALATE (TERYLENE). W. Reddish. *Trans. Faraday Soc.* 46, 459-75 (June 1950). The dielectric constant and loss tangent of the polyester, polyethylene terephthalate (Terylene), were determined as functions of frequency (10^2 to 10^7 c./sec.) and of temperature (-80° C. to 180° C.), and the volume resistivity in the high temperature region was studied. Three alternating current dielectric processes are distinguished, and effects associated with variations in the degree of crystallinity and in the water content of the material were investigated. Information on the coefficient of volume thermal expansion, water absorption, index of refraction, infra-red adsorption characteristics and heat resistance of this plastic is also given.

CHEMICAL RESISTANCE OF PLASTICS. Central Laboratory, Corrosion Department, Staatsmijnen, Heerlen, The Netherlands (1950). The resistance of 62 plastics and rubbers to 69 chemicals is shown in chart form with an accompanying explanatory booklet. Materials of practical interest to the Dutch chemical industry are considered.

RESISTANCE OF REPRESENTATIVE PLASTIC MATERIALS TO HYDROFLUORIC ACID. F. W. Reinhart and H. C. Williams, Jr. *A.S.T.M. Bull.* 1950, No. 167, 60-2 (July 1950). The resistance of representative plastic materials to hydrofluoric acid is reported. Changes in weight and dimensions after immersion in 48% hydrofluoric acid for 7 days were determined. The results of the tests show that urea-formaldehyde and cellulose acetate plastics are soluble at room temperature in 48% hydrofluoric acid. The phenolic laminate plastics containing cellulosic fillers were appreciably affected in less than a week; the one filled with asbestos

was affected more than those filled with cellulosic materials. The melamine plastics are markedly affected. The resistance of the glass-fabric polyester plastic was less than that of the cellulose-filled phenolic plastics. The behavior of the polymethyl methacrylate plastic was peculiar; it became swollen, rubbery, and milky, and was still swollen and milky although no longer rubbery six months after removal from the acid solution. The resistance of polystyrene was outstanding. Polyethylene and vinyl chloride acetate plastics were affected only slightly, although more so than polystyrene.

THEORY OF THE MECHANICAL PROPERTIES OF HOT PLASTICS. S. J. Loring. *Trans. Am. Soc. Mech. Engrs.* 72, 447-63 (1950). A theory is developed to describe the rubberlike elasticity and strain relaxation characteristic of plastics at high temperatures and is applied to polystyrene, polyethylene, and cellulose acetate plastics.

SORPTION BY ORGANIC SUBSTANCES. I. KRYPTON AND NITROGEN ON POLYETHYLENE, NYLON, AND COLLAGEN. A. C. Zettlemoyer, A. Chand, and E. Gamble. *J. A. C. S.* 72, 2752-7 (June 1950). The adsorption of nitrogen and krypton was measured on a simple hydrocarbon surface, polyethylene, at both liquid nitrogen and liquid oxygen temperatures. For nylon and collagen, krypton adsorption was measured at the two temperatures and nitrogen adsorption at one temperature.

THE STRUCTURE OF ESTER-LACTONE POLYMERS. I. ESTER-LACTONES OF THE MALEIC ANHYDRIDE-VINYL ACETATE INTERPOLYMER. L. M. Minsk, G. P. Waugh, and W. O. Kenyon, J. A. C. S. 72, 2646-50 (June 1950). The published structures of the ester-lactone polymers are correlated by analytical determination of various structural units. The polymers include principally lactone and maleic ester units with small amounts of maleic acid, vinyl acetate and possibly vinyl alcohol units. From the analytical values, the ratios of maleic units to vinyl units in the ester-lactones were calculated as being essentially unity, which is in agreement with the determined structure of the maleic anhydride-vinyl acetate resins used for esterification.

The analytical methods employed are described.

THE STRUCTURE OF ESTER-LACTONE POLYMERS. II. ESTER-LACTONES OF POLY- α -CHLOROACRYLIC ACID. L. M. Minsk and W. O. Kenyon. *J. A. C. S.* 72, 2650-4 (June 1950). Poly- α -chloroacrylic acid undergoes simultaneous esterification and lactonization when heated in solution in an alcohol. The derived polymer contains carboxyl, hydroxyl, and residual chlorine groups in addition to the predominating lactone and ester groups. Analytical methods for structural analysis of the ester-lactone polymer are described.

THE ANIONIC COPOLYMERIZATION OF METHYL METHACRYLATE-METHACRYLONITRILE. F. C. Foster. *J. A. C. S.* 72, 1370-2 (Mar. 1950). Relative reactivity ratios were determined for the copolymerization of methyl methacrylate-methacrylonitrile catalyzed by sodium in liquid ammonia. The values are significantly different from those for the free radical copolymerization of the same monomer pair.

A REDETERMINATION OF THE ABSOLUTE RATE CONSTANTS IN THE POLYMERIZATION OF LIQUID ACETATE. H. Kwart, H. S. Broadbent, and P. D. Bartlett. *J. A. C. S.* 72, 1060-6 (Mar. 1950). A much improved apparatus is described for determining absolute rate constants of liquid bulk polymerization by means of the rotating sector. Errors from previously recognized sources are greatly curtailed. The results of a redetermination of the absolute rate constants for the steps in the polymerization of liquid vinyl acetate are reported and are compared with the results of other investigators.

THE INFLUENCE OF PRESSURE ON THE POLYMERIZATION OF STYRENE. R. C. Gillham. *Trans. Faraday Soc.* 46, 497-503 (June 1950). The effect of pressure on the polymerization of styrene is found to be an increase in rate of polymerization of about ten-fold at a pressure of 3000 atm. An increase of molecular weight of the polymer is also obtained. The failure to maintain isothermal conditions is considered to be largely responsible for the much greater effects obtained by previous investigators.

U. S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25¢ each.

VINYL SULFONIC ACIDS. G. D. Jones and C. E. Barnes (to General Aniline). U. S. 2,515,714, July 18. Colorless polymers of vinyl sulfonic acids formed by removing oxygen by flushing with nitrogen, distilling, and polymerizing.

ALKYD RESINS. M. F. Cukier (to Pharma Chemical). U. S. 2,515,758, July 18. Resins produced by polymeric condensation of 1:2 cyclohexene oxide with a dicarboxylic acid.

CONVEYOR BELTING. T. M. Knowland (to Boston Woven Hose). U. S. 2,515,778, July 18. Conveyor belting comprising a body of rubberized fabric plies vulcanized together and covered with synthetic plastic composition bonded thereto.

PHONOGRAPH RECORD. E. M. Sadowski and E. D. O'Mahony (to R.C.A.). U. S. 2,515,800-1, July 18. Phonograph record containing polyvinyl acetal resins, ethyl cellulose, pinewood resin, and a filler.

SHEET MATERIAL. J. Mahler (to American Optical). U. S. 2,515,830, July 18. Apparatus for stretching sheets of moistened plastic.

RESINS. H. F. Minter and F. J. Nagel (to Westinghouse). U. S. 2,516,012, July 18. A fast-curing composition of an unsaturated alkyd resin, a condensate of a 1,3,5-dihydroxy-derivative of benzene and an aldehyde, a diester of a monohydric hydrocarbon alcohol and an acid half ester of a paraffinic polyhydric alcohol, and a metallic drier.

POLYORGANOSILOXANES. J. B. De Coste (to Bell Telephone). U. S. 2,516,047, July 18. Composition of a heat-curable polyorganosiloxane, a lead compound curing catalyst, and a pyrocatechol stabilizer.

POLYMERIZATION. B. M. Marks (to Du Pont). U. S. 2,516,064, July 18. Polymerization of dimethacrylate esters of a mixture of glycols in the presence of cobalt salts.

MOLDING. E. M. McElligoff (to Swedish Crucible). U. S. 2,516,065, July 18. Pearlescent plastic articles are molded by intermingling ground methylmethacrylate resin with ground polystyrene, heating, placing in a mold cavity, and molding with heat and pressure.

RESINS. H. Burrell and R. H. Barth (to Heyden Chemical). U. S. 2,516,104, July 25. Resin-acid ester-acetals of pentaerythritols.

POLYMERS. C. W. Tullock (to Du Pont). U. S. 2,516,162, July 25. Composition of a halogenated hydrocarbon and a copolyamide.

RESINS. E. G. Marhofer (to Phillips Petroleum). U. S. 2,516,230, July 25. Reacting clay tower polymers with sulfur in the presence of mercaptobenzothiazole.

PIPE LINING. C. G. Munger (to Amercoat). U. S. 2,516,242, July 25. Method of lining pipes and other structures with plastic sheets.

POLYMERIZATION. G. W. Borton and S. D. Hartshorn (to Pennsylvania Crusher). U. S. 2,516,295, July 25. Process for preparing homogeneously partially polymerized particles of thermosetting material.

CASTING. G. L. Fraser (to Monsanto). U. S. 2,516,309, July 25. Mixing an unsaturated polyester resin with a vinylidene monomer, a cobalt or manganese naphthenate, and a polymerization inhibitor, and curing at 15 to 40°C.

RESIN. M. T. Harvey and S. Caplan (to Harvel Research). U. S. 2,516,317, July 25. Producing a resin by reacting furfural with acetonyl acetone under alkaline conditions.

POLYAMIDES. D. C. Pease (to Du Pont). U. S. 2,516,585, July 25. Preparing synthetic linear polyamides having intralinear cyclic groups by heating terephthalic acid and bis(4-amino-3-methylcyclohexyl)-methane.

COMPOSITION. D. W. Young and W. J. Sparks (to Standard Oil Development Co.). U. S. 2,516,741, July 25. Tough plastic comprising a homogeneous mixture of styrene-isobutylene copolymer and a hard polyamide resin.

POLYMERIZATION. E. C. Chapin and G. E. Ham (to Monsanto). U. S. 2,516,835, Aug. 1. Contacting a homocyclic compound containing a carbonyl radical with an alkali metal methoxide in the presence of an alcohol.

POLYMERS. E. K. Drechsel and W. M. Thomas (to American Cyanamid). U. S. 2,516,836, Aug. 1. A 1-unsaturated hydrocarbon, N-phthaloyl substituted urea and polymers thereof.

EXPLODED FIBERS. R. M. Boehm (to Masonite). U. S. 2,516,847, Aug. 1. Mixing resinous material and ligno-cellulose fiber in a closed chamber, treating with high-pressure steam, and explosively discharging into a region of reduced pressure so the cellulosic material is defibered and the resin is cured.

COPOLYMERS. D. Swern (to U.S.). U. S. 2,516,923, Aug. 1. Copolymer of a monomeric olefin and an unsaturated ether.

POLYMERS. J. M. Butler and C. H. Rector, Jr. (to Monsanto). U. S. 2,516,955, Aug. 1. A plasticized polyvinyl chloride containing an ester of p-phenylene-dioxydiacetic acid and an alcohol.

COPOLYMERS. D. D. Coffman (to Du Pont). U. S. 2,516,960, Aug. 1. A copolymer of ethylene and a 1,2-alkylene oxide.

MOLDING POWDERS. E. F. Meitzner (to Rohm and Haas). U. S. 2,517,127, Aug. 1. Exposing a polymer or copolymer of styrene and an acrylate to mercaptan vapors.

UREA RESIN. V. C. Meunier and C. M. Cox (to Rohm and Haas). U. S. 2,517,128, Aug. 1. A urea-formaldehyde-oxazolidine copolymer resin.

POLYVINYL BUTYRAL. R. R. Lawrence (to Monsanto). U. S. 2,517,218, Aug. 1. A polyvinyl butyraldehyde acetal resin, plasticizer, and filler.

RESINS. T. P. Malinowski (to Monsanto). U. S. 2,517,222, Aug. 1.

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Oil-soluble resin comprising the heat-reaction product of hydroxydihydro-dicyclopentadiene and the heat reaction product of maleic anhydride and an ethylenically unsaturated monovinyl benzene homopolymer.

MARKING APPARATUS. T. Miller (to George Gorton Machine). U. S. 2,517,502, Aug. 1. Apparatus for producing indicia markings on work surfaces.

TUFTED FABRIC. L. A. Stanley (to Kendall). U. S. 2,517,529, Aug. 1. A washable fabric having tufts of fibers bonded thereto with a urea or melamine resin.

FILM STABILIZATION. R. D. Lowry and H. L. Schaefer (to Dow). U. S. 2,517,581, Aug. 8. Heat-treating crystalline vinyl chloride-vinylidene chloride copolymer film to dimensionally stabilize same.

POLYMERS. C. W. Tullock (to Du Pont). U. S. 2,517,610, Aug. 8. Composition comprising an alicyclic ketone and a copolyamide obtained by condensation of a mixture of the N-carboanhydrides of several α -monocarboxylic acids with carbon dioxide.

HEAT SEALING. W. L. Jenkins (to Goodrich). U. S. 2,517,672, Aug. 8. Apparatus for dielectric heat sealing of thermoplastic materials.

POLYMERIZATION. I. E. Muskat (to Marco Chemicals). U. S. 2,517,698, Aug. 8. Impregnating a fibrous base with a polymerizable resin, placing between flexible sheets, pressing, clamping the cover sheets, and heating to cure and cause the cover sheets to shrink against the laminate.

PLATE CURVING. H. Oettinger, Jr. (to Electrographic). U. S. 2,517,701, Aug. 8. Producing curved printing plates from thermoplastic resin.

POROUS SHEET. M. R. Ximenez and J. H. Ferguson (to Johns-Manville). U. S. 2,517,753, Aug. 8. Microporous sheet comprising a core of matted glass fibers and impregnated with a mixture of siliceous filler particles and vinyl chloride-vinylidene chloride copolymer.

HOT METAL. A. E. Young and K. D. Bacon (to Dow). U. S. 2,517,754, Aug. 8. A wax-free hot-melt coating composition of ethyl cellulose, a refined mineral oil and an ethylene-

diamine polyamide of a partially polymerized acid.

SILOXANE RESINS. H. N. Fenn and L. A. Rauner (to Dow Corning). U. S. 2,517,777, Aug. 8. Resinous polysiloxane.

RESIN. A. J. Appelquest (to American Cyanamid). U. S. 2,517,824, Aug. 8. Formaldehyde condensate of dicyandiamide and a cycloaliphatic ketone.

POLYMERS. R. W. Upson (to Du Pont). U. S. 2,517,945, Aug. 8. A fiber comprising polymeric N,N'-hexamethylenebenzene boronamide.

MOLDING. H. Corbett. U. S. 2,518,124, Aug. 8. Machine for mixing and molding plastic materials.

POLYMERS. K. M. Gaver (to Ohio State University Research Foundation). U. S. 2,518,135, Aug. 8. Reacting glucopyranose polymers with alkali metal hydroxide in alcoholic solution to prepare uniformly 2-substituted polymers.

POLYMERS. W. A. Jordan, S. H. Shapiro, and J. M. Schrager (to Armour). U. S. 2,518,148, Aug. 8. Reacting a diamine with a polyene monobasic fatty acid to produce a polyamide; heating to polymerize.

POLYSILOXANES. K. N. Mathes (to G. E.). U. S. 2,518,160, Aug. 8. Curing a hydrocarbon-substituted polysiloxane resin with benzyl trimethyl ammonium butoxide.

POLYVINYL ALCOHOL. F. K. Signaigo (to Du Pont). U. S. 2,518,183, Aug. 8. Titanating and insolubilizing polyvinyl alcohol film which after treatment is transparent to visible light.

COPOLYMERS. R. C. Morris and J. L. Van Winkle (to Shell). U. S. 2,518,245, Aug. 8. Heating an alkylene glycol with a bis(hydroxyethyl)sulfide in the presence of a dehydration catalyst.

FIBERS. E. F. Casassa (to Du Pont). U. S. 2,518,283, Aug. 8. Using zinc borate as a catalyst in the production of polymeric bis-2-hydroxyethyl terephthalate.

POLYHYDRIC ALCOHOL ESTERS. F. W. Hoover (to Du Pont). U. S. 2,518,321, Aug. 8. An ether of a polyhydric alcohol in which one hydroxyl hydrogen atom is replaced with a vinyl group and the remaining hy-

droxyl hydrogens are replaced by 2-alkenyl groups.

POLYMERS. R. M. Joyce, Jr. (to Du Pont). U. S. 2,518,440, Aug. 15. Polymeric materials containing a number of four-carbon glycol units.

COPOLYMERS. J. B. Rust (to Montclair Research and Ellis-Foster). U. S. 2,518,494-5-6-7, Aug. 15. Copolymers of a vinylidene compound and an unsaturated natural resin acid ester.

POLYMERIZATION. K. H. Weber and P. O. Powers (to Armstrong Cork). U. S. 2,518,509, Aug. 15. Polymerizes of conjugated dienes, vinyl compounds, and vinyl esters.

RESINS. H. S. Bloch (to Universal Oil Products). U. S. 2,518,519, Aug. 15. Production of a resinous product comprising reacting a carbohydrate allyl ether with an unsaturated ester of a dicarboxylic dienophilic acid adduct of a mixture of cyclic polyolefinic hydrocarbons.

MOLDING. F. W. Blanchard and A. C. Borkenhagen (to Hewitt Rubber). U. S. 2,518,594, Aug. 15. Injection molding machine and method.

ION EXCHANGE. S. Sussman (to Permutit). U. S. 2,518,956, Aug. 15. Anion-exchange resin prepared by condensing a polyethylene polyamine with an aldehyde.

THERMOSETTING RESIN. W. I. Weaver (to L-O-F). U. S. 2,518,963, Aug. 15. Reacting formaldehyde and N, N-ethylene urea.

MOLDING. I. E. Bankey (to Lucas County Bank). U. S. 2,519,014, Aug. 15. Compounding-molding machine.

POLYMERIZATION. N. M. Elmore and D. W. Young (to Standard Oil). U. S. 2,519,034, Aug. 15. Low temperature polymerization of mixed olefins with aluminum chloro bromide.

POLYMERIZATION. R. A. Jacobson (to Du Pont). U. S. 2,519,135, Aug. 15. Polymerizing monoethylenic monomers in an aqueous medium containing oxygen-yielding catalyst and a sulfonic acid.

VINYLDINE CHLORIDE. T. Houtman, Jr. (to Dow). U. S. 2,519,189, Aug. 15. Protection of vinylidene chloride polymers from the effects of light by incorporating therein 2-hydroxy-3, 5-dichloro-acylphenene.

**Now you can heat bigger
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MODEL "15-R"

**COMPACT,
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THIS SPECIAL PURPOSE rugged THERMEX model is designed for preheating dielectric materials such as large plastic preforms.

It will heat 12 pounds of average molding material from 70° to 250°F. in one minute—or greater loads in a slightly longer period. It accommodates material up to six inches in height. Other advantages this 15-R THERMEX brings to you include:

1. Compact construction reduces floor space requirement and unique sectionalized design assures maximum flexibility for special installations.
2. All operating meters and timers are mounted on a frame where provision is also made for connections for remote control.
3. Material handling tray mounted on ball bearing slides.

4. Constant voltage filament transformer. Line voltage may vary from 380 to 500 volts without damage to tubes.

5. Convenient hand wheel to provide quick adjustment of electrode height when dissimilar loads must be heated.

These features of THERMEX model "15-R" may suggest its use in your process. If so write or wire us today for more information.



THERMEX—T. M. Reg. U. S. Pat. Off.

December • 1950

SPECIFICATIONS

Width	37 inches
Depth	37 inches
Height	88 inches
Work Level	37½ inches
Tray dimensions	28 x 35 inches
Net weight	2650 pounds
Electrode dimensions: (standard)	20 x 20 inches

All steel construction with copper plating where necessary, totally enclosed

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NEW MACHINERY AND EQUIPMENT

GUILLotine CUT-OFF—Plastics, rubber, and paperboard sheet or slab stock up to 48 in. wide can be handled by a new guillotine-type cut-off machine recently announced by Black Rock Mfg. Co., Hancock & Osborne St., Bridgeport 5, Conn. The equipment, model 4M-48, will cut off thicknesses of from $\frac{1}{4}$ to $1\frac{1}{4}$ in. depending upon the type of tripping mechanism and conveyor assembly used. A one-revolution clutch arrangement, operated through a solenoid trip mechanism, lends itself readily to various types of electrically operated tripping devices furnished by Black Rock. The main shaft of the cutter, which operates the knife carriage, is driven by a heavy, cast flywheel powered by a 5-hp., 1200-r.p.m. motor. The machine has a base of welded steel supporting a heavy cast Meehanite cutting block.

ROTARY TABLET PRESS—High-speed production of a wide range of tablet sizes and plastic preforms is accomplished by a new double rotary tablet press designed by Arthur Colton Co., Div. Snyder Tool & Engineering Co., 3400 E. Lafayette Ave.,

Detroit 7, Mich. Colton's Model No. 227 has a maximum production capacity of 1575 tablets a minute, maximum tablet diameter of $\frac{1}{2}$ in., and a maximum cell depth of $\frac{3}{4}$ inch.

There are 27 punches and two stamping stations on the machine which exerts a maximum pressure of 5000 pounds. Uniformly accurate tablet weight is assured by a micrometer cell adjustment. In operation, dies are overfilled and leveled off to proper cell depth. Variable speed drive permits operating speeds to be adjusted to suit different types of tablet material. Power is transmitted to the head through a twin-disk clutch. An adjustable automatic excess pressure release protects machine elements against accidental damage.

The rotary head is driven by a heat-treated, ground worm and worm gear. It is completely guarded, because no opening for head drive is necessary; thus, tablet material cannot sift down into the drive mechanism. A standard 2-hp. 1800-r.p.m. motor is sufficient to power the equipment.

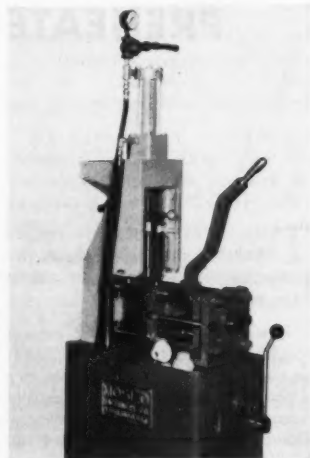
COMPACT HYDRAULIC SYSTEM—Increased use of hydraulic equipment in general plant operations has given rise to a demand for separate compact hydraulic systems. To meet this need, Harco Industries, Inc., 20 Curtrice St., Rochester 5, N.Y., has created a line of 118 hydraulic units available in capacities of from 1.8 to 8.25 gal. per minute, and at pressures up to 1000 p.s.i. The systems are provided with motors of from $\frac{1}{4}$ to 5 hp., with manual, electro-pneumatic, or hydraulic control.

INJECTION MOLDER—Faster and more convenient injection molding of small plastic pieces are claimed for the Minijector $\frac{3}{4}$ -oz. injection molding machine introduced by Moslo Machinery Co., 2443 Prospect Ave., Cleveland 15, Ohio. The equipment

is also said to be useful for die try-out work and for molding dentures in dental laboratories.

Designated Model No. HC-75, the completely self-contained machine uses a hydraulic system for injection. Other features are a simplified knockout arrangement in the clamp assembly and a built-in chute for discharging molded objects. HC-75 handles all thermoplastics, but can be supplied at extra cost with additional accessories for molding nylon. Another accessory designed to reduce down-time is an interchangeable heater assembly unit which facilitates changing from one color to another, or from one type of plastic to another.

Major specifications for the new machine include: injection rate of 0.44 cu. in. of material per sec., with a plasticizing capacity of 5.5 lb. per hour; maximum pressure on oil, 1200



p.s.i.; pressure on material, 8600 lb.; mold size, 6 in. long, 5 in. top width, 5 in. high; maximum casting area, 6 sq. in.; 550-watt heater assembly in the injection cylinder; and power consumption of the heating unit when plasticizing to full capacity, about 6 amp. at 110 volts.

DRUM SLING—Development of a new drum sling makes it possible for a single workman to replenish easily and quickly the hoppers of molding and tabletting presses from drums holding up to 300 lb. of material. A product of F. J. Stokes Machine Co.,



NEW!

VAN DORN 2-ounce Injection Press



Utilizing the same rugged construction with doubled capacity, this Van Dorn press now offers you more profitable production with molding time reduced 30% to 50%. The new press has a larger heating cylinder with more plasticizing capacity; greater injection pressure; faster cycling due to larger motor and pump; and a unit for cooling hydraulic oil. Surprisingly low in price, this versatile press

uses inexpensive molds, can be set up by one man in 20 minutes, and operates 8 hours for under 1 dollar!

With all these features, this remarkable press is *unequalled* in the 2-ounce capacity class for molding practically all thermoplastics, including nylon.

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5900 Tabor Rd., Philadelphia, Pa., the sling can accommodate drums of from 16 to 24½ in. in diameter and 24 to 36 in. in height.

In use, the sling is placed on the floor and the drum is placed on the lower support member at floor level, after which the upper support member is firmly secured by two hand-wheel screws. The entire unit is then raised by chain hoist to a position over the hopper and the drum is rotated on pivot bolts located at the center of gravity. The contents of the drum are thus discharged through a canvas sleeve with shut-off valve which unfolds from the inverted top support.

TOGGLE CLAMP—Latest in the De-Sta-Co line manufactured by Detroit Stamping Co., 327 Midland Ave., Detroit 3, Mich., is a compact, quick-acting toggle clamp for production work-holding fixtures. The new stamped steel clamp, No. 235-U can exert holding pressures up to 650 pounds. When the clamp is open the clamping bar moves into a fully retracted vertical position, allowing maximum clearance for speedy in-

sertion and removal of work. The handle is designed with full hand clearance to allow easy, safe operation. Other features include a rubber tipped bolt assembly, adjustable both horizontally and to work height; height 2¾ in. (closed), 6¼ in. (open); length, 10¼ in.; and weight, 1¼ pounds.

TURN-TABLE STAND—Easy handling of heavy dies, molds, patterns, and castings during hand finishing operations is facilitated by the Di-Ro-Stand, manufactured by Pratt & Whitney, Div. Niles-Bement-Pond Co., W. Hartford 1, Conn. Designed primarily for use with the firm's Kelerflex flexible shaft machines—but adaptable to any other similar type unit or portable grinder—the stand is 2 ft. square, 30 in. high, and has a turn-table on which heavy work can be rotated freely. The turn-table is mounted on a heavy-duty thrust bearing, and is capable of handling work loads up to 3 tons. A clamp permits work to be locked in any position.

Use of the stand is said to eliminate injuries which might be caused

by handling heavy work on wooden benches. A hinged arm, attached to the side of the stand, is provided to mount a flexible shaft machine, al-



lowing it to swing in an arc of 180°, thus giving the operator freedom of movement. A storage compartment for tools and accessories is located inside the stand with access through a steel door in front.

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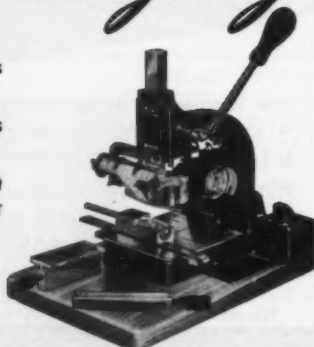
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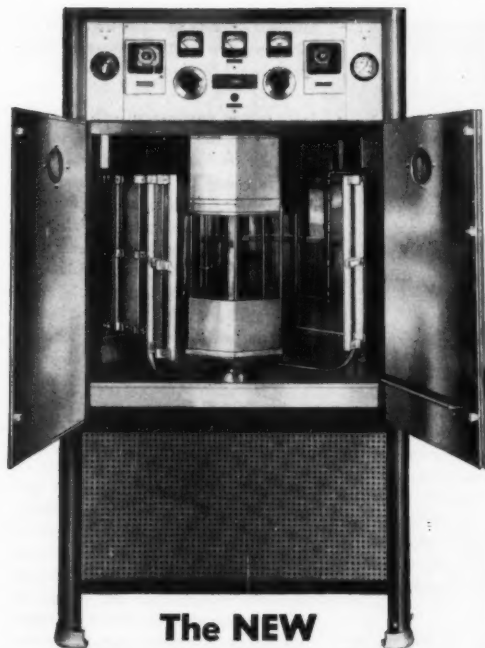
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Radiation is from a Sunshine Carbon Arc which is of the motor-driven, open-flame type. Natural sunlight or intensified ultra-violet radiation is available depending upon the type of carbons and filters used. The light source has been improved to provide 16 hours of continuous operation as well as a number of other added conveniences.

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Type XW is fully automatic and may safely be left in unattended operation overnight. If deionized water is to be used, aluminum spray piping can be furnished. The capacity of the stainless steel lined testing chamber is 54 panels. The machine is sturdily constructed and is shipped assembled, ready for connection.

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BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"Directory of Chemicals and Producers, 1951"

Published by McGraw-Hill Publishing Co., Inc., 330 W. 42nd St., New York 18, N. Y. 350 pages. Price \$20.

This long-needed index furnishes the chemical industry with an accurate and comprehensive compilation of sources of supply. Confined to the prime producers and manufacturers (including refiners and processors), the directory lists alphabetically all American chemical manufacturers, the chemicals they produce, and the various grades of those materials available.

Product listings include all chemical raw materials, industrial and fine chemicals, dyestuffs, and such semi-finished products as synthetic resins and metal powders. In addition, synonyms and trade names are cross indexed, and different grades of the same chemical are listed separately along with information on location of shipping points throughout the country.

"Industrial Chemicals" by W. L. Faith, Donald B. Keyes, and Ronald L. Clark.

Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 602 pages. Price \$8.

Essential technical and economic data for 106 major commercial chemicals are given concise coverage in this book. Dealing with each chemical separately, the authors supply information on the latest manufacturing processes, equations for principal reactions, and average yield expectations, raw material requirements, and a generalized use pattern plus a thorough presentation of the economic aspects of producing these chemicals.

"Frictional Phenomena" by Andrew Gemant

Published by The Chemical Publishing Co., Inc., 38 Court St., Brooklyn 5, N. Y. 497 pages. Price \$12.

Frictional processes are dealt with on a physical basis and from the viewpoint of engineering applications. Composed of a series of articles written some years ago, the

book is supplemented by a chapter titled "Problems with Solutions" dealing with practical situations.

"Davison's Rayon and Silk Trades"

Published by Davison Publishing Co., Ridgewood, N. Y. 811 pages. Price \$7.50 (office edition), \$9.50 (pocket edition).

The 1950 edition of the annual register and technical compendium of the rayon, nylon, and other synthetics and silk industries of the United States and Canada consists primarily of a state-by-state listing of manufacturers' mills. Appended to the dealers' section is technical information of interest to members of this trade.

Adhesives—Highlight of this eight-page catalog section on adhesives is a table listing by number each adhesive, the materials for which they are specifically recommended, and the method by which the most effective bond is created. Materials listed are: Buna N, Neoprene, and natural and GRS rubber compounds and coated fabrics; sponge and foam rubber; laminating materials such as metal foils, cellophane, coated paper, films, etc.; plastics; paper, cardboard, and boxboard; leather; duck, cloth, felt, and flock; wood, Masonite, and Formica; and linoleum and metals. *The B. F. Goodrich Co., 448 S. Main St., Akron, Ohio.*

Cellulose esters—Written primarily as a laboratory manual, this 59-page book covers a line of standard types of cellulose esters. Included is comprehensive and detailed information on uses and specifications; the compatibility of these esters with solvents, resins, and plasticizers; and procedures of analysis. The text is primarily a laboratory manual for those working on textile coatings and impregnations; paper coating and impregnations; lacquers; molding compositions; paint and lacquer removers; photographic film sheeting; laminated foil; tape and thread; protective strippable coatings; and synthetic fibers. Many helpful charts,

tables, sketches, and photographs accompany the text. *Tennessee Eastman Corp., Kingsport, Tenn.*

Laboratory equipment—Over 25,000 pieces of laboratory apparatus and supplies are listed in Catalog No. 450 just released by this manufacturer and supplier of laboratory chemicals and scientific equipment. The up-to-date reference work features a convenient cross index listing items by name and again by function. In addition, the 7-lb., 986-page tome serves as an authoritative check on whether or not any particular item is obsolete. Bound in green leather, the catalog is available to laboratories from *Burrell Corp., 2223 Fifth Ave., Pittsburgh 19, Pa.*

Silicone rubber—Accompanied by a tabulation of representative fabricators and the various ways in which they employ the material, the technical bulletin, Silastic Facts No. 10, presents information on properties and performance of silicone rubber. Important data have been assembled on the effects of extremely high and low temperatures on such properties as hardness and compression set. The rubber is claimed to be serviceable over a span of from -100° to more than 500° F. Effects of accelerated aging tests and information on Silastic's weather, chemical, and oil resistance are also outlined. *Dow Corning Corp., 592 Saginaw Rd., Midland, Mich.*

Bibliography on non-metallic bearings—From literature of the past 12 years, 101 references have been selected for this annotated publication. All aspects of non-metallic bearings are covered—such as their manufacture, design, properties, wear, lubrication, performance, testing, and application—with particular emphasis on bearings made of laminated phenolic, nylon, resin-impregnated cotton fabric, Micarta, rubber, and wood. Designated "ESL Bibliography No. 6," the report is available for \$2.00 from *Engineering Societies Library, 29 W. 39th St., New York 18.*

Fluid pressure boosters, Bull. B-2001

—How the firm's line of fluid pressure boosters can be used to save space and weight, cut costs, and increase efficiency in various operations accomplished by compressed air or hydraulic power is the subject of this

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work. Topics covered include: when to use boosters in place of air cylinders or hydraulic pumps; how boosters operate to produce practically any desired hydraulic output up to 10,000 p.s.i. from ordinary plant air or hydraulic pressure; and how to select the proper booster size, model, and type. Detailed descriptions are presented on single- and double-acting boosters in single- and dual-pressure circuits. *Miller Motor Co., 4027 N. Kedzie Ave., Chicago 18, Ill.*

Plastics in upholstery—Advantages to be found in plastic-coated or all-plastic material for upholstery use are emphasized in the booklet, "Why Are They Buying Plastic Upholstery?" Qualities of plastics receiving special attention are unlimited range of color and design, ease of cleaning and maintenance, durability, versatility, and economy. Also provided are selling and advertising tips. *Plastic Coatings & Film Association, 9 Rockefeller Plaza, New York 20.*

S.P.I. membership—Facts about membership in S.P.I. and the value of the organization's work on behalf of the plastics industry are contained in

this new booklet designed as a guide for enlisting new members. A record of the group's accomplishments is presented. *The Society of the Plastics Industry, Inc., 295 Madison Ave., New York 17, N. Y.*

Selection of centrifugal pumps, Bull. No. 52B6059G—Economical pumping units for every industry are cataloged in this new 16-page guide. Photographs show of a wide variety of pumps; presented also are head capacity charts and tables, and data on sizes, capacities, and construction features. *Allis-Chalmers Mfg. Co., 1124 S. 70th St., Milwaukee, Wis.*

Hydraulic cylinders, Catalog No. 233-A—Complete information on hydraulic cylinders is contained in this 28-page summary which lists specifications; design, construction, and operation features; and suggestions for use of high-pressure equipment. Machines are available for working pressures up to 1500 p.s.i. *Hanna Engineering Works., 1765 Elston Ave., Chicago 22, Ill.*

Polyethylene—Characteristics, development history, and latest appli-

cations of Bakelite polyethylene are summarized in this new booklet. The influence of the material on the packaging field is given prominence. Various methods of processing are discussed. *Bakelite Div., Union Carbide and Carbon Corp., 300 Madison Ave., New York 17, N. Y.*

Burnishing machines, Bull. No. TDB-50—A new development in equipment for wet ball burnishing and polishing, the completely automatic Tumb-L-Dur burnishing machine, is covered in this new bulletin. The unit's principal feature is a durable, warp-resistant, molded barrel produced from what is claimed to be an exclusive material. *Lupomatic Industries, Inc., 4510 Bullard Ave., New York 66, N. Y.*

Flow pumps—Construction advantages, specifications, and drive requirements of the recently designed 5-in. stroke Multiplex direct flow pumps are set forth in Data Sheet 64-B. Information is offered on both the five- and seven-plunger units, whose daily capacity at 100 r.p.m. is from 292 to 5060 barrels. *The Aldrich Pump Co., 1 Pine St., Allentown, Pa.*

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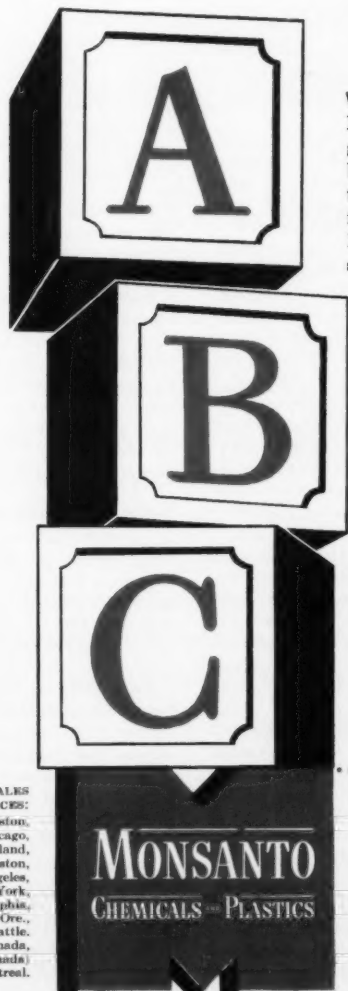
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INTERNATIONAL PLASTICS NEWS*

Activities Around the World of Interest and Importance to the Plastics Industry in the United States

Woven Filter Cloth—A filter cloth woven of unplasticized polyvinyl chloride fiber is reported by Redi-weld Ltd., London, to be achieving notable success in the plating industry as anode bags. It is said to have high chemical resistance and to be superior to nylon weaves for the purpose.

Acetate Film—Morane, a low-temperature heat-sealing clear cellulose acetate film 0.001 in. thick is being marketed by Morol Ltd., Ashford, Middlesex, England. The sealing temperature is 85° C. It can be sealed to all types of paper and board, and is being used for showcards, maps, and in packaging.

Benzol Production—A study of technical aspects of benzol production in United Kingdom gasworks has been published by the British Ministry of Fuel ("Benzol and Toluene from Coal Gas": 5s. 6d.). More than 300 gasworks were visited during the four-year study. There are 23 large tables of results.

Lamp Lenses—Molded in optically clear Perspex acrylic, the latest development of Nife Batteries Ltd., Redditch, Worcestershire, England, is a one-piece combined bezel and lens for industrial electric lamps. It is screwed directly on to the head-piece of lamps (especially the miniature type used extensively in mines), is said to increase candlepower by 10%, and gives wide light diffusion.

Plastics at Fairs—Indicative of the revival and growth of the plastics industry in Europe since the war, most European trade fairs now include special plastics sections. At the recent Western Trade Fair, in Turin, Italy, exhibitors of plastic materials, products, and machinery numbered about 100, including Italian agents. Exhibitors came from

U.S.A., Canada, Great Britain, Switzerland, and France.

Another representative display was recently staged at the Royal Netherlands Fair, Utrecht, Holland. Here again exhibitors of plastics products and materials numbered nearly 100. Products were mostly household articles, toys, and similar small goods.

Much interest is being aroused at these Fairs in post-war machinery designed and built in Europe.

Tools For Hire—A new company has been established in England, called Tool Exchange Ltd., 3 Vere St., London, W.1., to hire out surplus British plastic molding tools to European, British Commonwealth, and other overseas molders. British tools will be supplied on a royalty basis, and the scheme should enable overseas users of such equipment to keep prices down.

French Exports—France is enjoying a steadily increasing overseas trade in plastic products, although of course her imports of plastics materials far exceed exports in that category. For the first seven months of 1950, imports of plastics products totalled 594 quintals (1 quintal = 100 kilos), valued at Fr. 66.6 million. Molded items accounted for more than two-thirds of the total. Exports, on the other hand, reached 1169 quintals (Fr. 97.1 million), with non-molded items earning Fr. 81.17 million.

Imports of plastics materials (all forms) were 43,914 quintals (value, Fr. 1325 million) and exports were only 13,876 quintals (value, Fr. 507 million).

Israeli Plant—Production has started in a new plastics plant Bnei Brek, near Tel Aviv, Israel, operating under the name of Dura Plastics Factory. The organization has a capital of \$1 million and at present employs 50 workers; within two years

it hopes to have 200 workers. Production is presently confined to sanitary ware, toilet goods, toys, etc.

Batteries—A lightweight 24-v. battery, with molded polyethylene container, specially designed for aircraft, was featured by Chloride Batteries Ltd., Manchester, England, at the recent display of the Society of British Aircraft Constructors. Another interesting battery at the same display was shown by Peto and Radford Ltd., Dagenham Dock, England. It is the non-spillable type, specially intended for aerobatic aircraft, and is fitted with Davis styrene vent plugs and polyethylene connector covers.

British Nylon—Having reached its initial target production level of 10 million lb. of nylon yarn per year, the three-year old factory of British Nylon Spinners, Pontypool, Monmouthshire, England, is now to be extended. Work is scheduled to begin next spring.

Exhibition in India—So successful was the first National Plastics Exhibition in Calcutta in January 1950 that it has been decided to hold the exposition annually. The second presentation will be made late in January 1951, and all foreign firms are invited to take part. Popular Plastic Products, 4 Upper Chitpur Rd., Calcutta, India, sponsor of the exhibition, states that there is no charge for and no limit to the space available to foreign exhibitors.

Skeletons—Exporting some 75% of its products, Educational and Scientific Plastics Ltd., 392a London Rd., Croydon, England, is turning out large quantities of cast acrylic skeletons and other osteological models for educational and medical uses.

South African Chemical Plant—Industrial Chemical Products S. A. (Pty.) Ltd., Johannesburg, South Africa, has completed construction of a new plant at Lilianton, Boksburg. The plant will be used for the production of industrial, metallurgical, and agricultural chemicals, and various chemical specialties. The new plant will replace an old factory at Booysens, Johannesburg, which the company has been operating since 1939. It will have five times more capacity than the existing facilities.

—Howard Williams

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Production of

FOR the purpose of this report, production is the sum of the quantities of materials produced for consumption in the producing plant, for transfer to other plants

PLASTICS AND SYNTHETIC RESIN PRODUCTION From Statistics Compiled

Materials	Total prod'n, first 8 mos. 1950	Total sales first 8 mos. 1950
CELLULOSE PLASTIC:^a		
Cellulose acetate and mixed ester plastics:		
Sheets, continuous:		
Under 0.003 gage	7,755,631	7,780,371
0.003 gage and over	6,207,046	6,381,788
All other sheets, rods, and tubes	2,853,090	2,498,061
Molding and extrusion materials	52,243,105	50,478,059
Nitrocellulose:		
Sheets	4,080,728	3,888,906
Rods and tubes	1,092,037	748,641
Other cellulose plastics ^b	7,771,446	8,028,202
PHENOLIC AND OTHER TAR ACID RESINS:		
Laminating	44,656,059	30,638,383
Adhesives	19,014,212	16,968,770
Molding materials ^a	141,636,091	117,879,832
Protective coatings (containing less than 10% modifier)	14,217,701	11,391,081
Miscellaneous uses (including casting)	41,145,828	39,421,394
UREA AND MELAMINE RESINS:		
Adhesives	48,690,543	46,583,604
Textile- and paper-treating resins	18,394,441	14,238,387
Protective coatings, modified and unmodified	19,075,623	16,648,851
Miscellaneous uses, including laminating and molding ^c	43,603,851	40,629,023
STYRENE AND STYRENE DERIVATIVE POLYMER AND COPOLYMER RESINS:		
Molding materials ^a	163,734,096	175,320,721
Miscellaneous uses ^d	93,590,812	30,331,592
VINYL RESINS:		
Sheeting and film, including safety-glass sheeting ^a	147,310,347	137,090,867
Adhesive (resin content)	11,931,011	10,981,078
Textile- and paper-treating resins, including spreader and calendaring types (resin content) ^e	29,751,296	29,096,024
Molding and extrusion material (resin content)	73,841,625	70,804,983
Miscellaneous uses (resin content) ^e	14,820,555	8,735,721
MISCELLANEOUS SYNTHETIC PLASTICS AND RESIN MATERIALS:		
Molding materials ^{a, f}	37,692,538	37,355,789
Protective coatings ^g	44,663,824	45,101,406
All other uses ^h	63,442,235	130,237,806

^a Includes fillers, plasticizers, and extenders. ^b Includes sheets, rods, and tubes, and molding and extrusion materials. ^c Data on resins for laminating and miscellaneous uses are on a dry basis; data on molding materials are on the basis of total weight. ^d Excludes data on protective coating resins; these data are included with miscellaneous coating resins to avoid disclosure of

Plastics Materials

of the same company, and for sale. Sales include only the quantities involved in bona fide sales in which title passes to the purchaser.

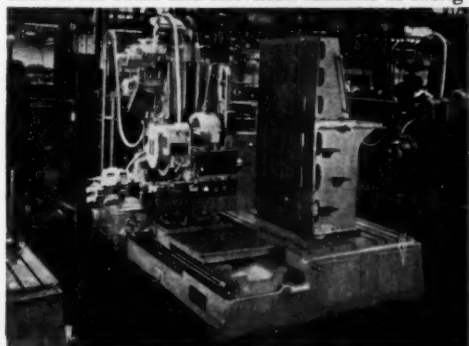
IN POUNDS FOR JULY AND AUGUST, 1950 by U. S. Tariff Commission

July 1950		August 1950	
Production	Sales	Production	Sales
1,129,555	1,304,746	1,037,513	1,070,239
909,545	965,386	1,151,743	1,248,743
357,972	347,214	396,025	393,224
7,240,421	7,349,103	8,389,341	8,106,380
441,700	454,790	620,258	584,795
121,011	84,585	177,389	153,460
829,616	726,411	1,110,668	1,352,487
4,914,407	3,354,475	6,213,350	4,812,781
1,763,225	1,782,917	3,049,174	2,405,419
14,716,069	13,519,793	22,256,471	17,174,812
1,717,593	1,482,861	1,999,241	1,709,553
4,507,671	4,163,029	6,539,518	5,293,939
6,014,451	6,146,312	8,479,957	8,023,019
2,199,795	1,888,901	2,797,286	2,631,039
2,732,818	2,235,287	2,796,517	2,757,172
5,290,956	4,889,150	6,716,827	6,996,214
23,054,988	22,765,814	23,138,953	25,385,043
3,515,159 ¹	3,667,958	4,854,142	4,874,303
18,868,186	17,319,961	19,388,947	22,815,159
1,452,104	1,300,607	1,860,462	1,852,448
3,645,772	3,701,358	4,072,919	4,766,972
8,721,503	7,950,617	8,941,851	10,611,845
1,687,990	1,048,703	1,878,075	1,464,995
4,345,977	4,651,408	5,744,418	5,362,213
6,280,958	5,902,059	7,208,658	8,157,331
17,221,192	16,905,575	18,224,475	18,010,954

operations of individual companies. ¹ Includes data for spreader and calendaring type resins. ² Includes data for acrylic, polyethylene, nylon, and others. ³ Includes data for coumarone-indene, petroleum, silicone, and other protective coating resins. ⁴ Includes data for acrylic, alkyd, coumarone-indene, nylon, petroleum, silicone, and others for miscellaneous uses. ⁵ Revised.

NOW WE CAN DUPLICATE CAVITIES AND CORES UP TO 36" x 60" x 18" DEEP

One of the largest of its kind, our new Keller duplicating machine enables us to cut huge molds such as for radio and television cabinets or refrigeration parts. The shape of the master form is accurately and rapidly reproduced in the new mold through automatic electrical controls.



For estimates on all types of molds, consult the



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There's a precision-accurate Detecto Scale for your specific weighing and counting need. The Detecto helps increase production, yet assures you maximum accuracy by making slightest weight discrepancies immediately visible.

DETECTO-GRAM RATIO COUNTING SCALE

Another Detecto-Gram Scale to speed counting operations. Model #1743 has a special counting tray attached to the beam for use when counting in odd amounts.



Write For Literature

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SCALE ENGINEERS IN ALL PRINCIPAL CITIES

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PLASTIC PARTS MOLDED BY WATERTOWN

In the new "940", Sonotone was out to pack a lot of hearing aid into the smallest possible instrument . . . here's how Watertown helped.

We injection-molded the durable frame piece of Plexene for strength and light weight . . . the complex little tube socket was precision designed and transfer-molded to tightly fix the tiny tubes and wires. Sonotone hearing aids must be built to take a bouncing . . . electrical connections must be snug . . . hundreds of parts have to fit compactly . . . Watertown makes absolutely sure they do.

We've been doing this sort of thing for 35 years. If you have a plastic problem why don't you get in touch with us. We're sure to have the answer for you.

WATERTOWN MANUFACTURING CO.
1000 Echo Lake Rd., Watertown, Connecticut



Courtesy The Borden Co.

Lighter, stronger models are made easier when new resin-cloth technique is used

Bell Model

LIGHT-WEIGHT, durable mockups are said to be made more efficiently by a new technique, involving urea resin, engineered by Walter Dorwin Teague and the Chemical Div., The Borden Co., both of New York, N.Y. This method was first applied to the pilot model of a giant bell which has been touring this country as part of a freedom campaign. The bell model weighs 250 lb.; the original, cast in England for the Crusade of Freedom, weighs 10 tons. It was recently installed in a belfry in Berlin.

For production of this mockup, a male form, made of wood, was machined to the inside contour of the bell. Next, layers of a thin cloth similar to cheese cloth, impregnated with Casco Resin #150—a craze-resistant urea resin—were laid up on the surface of the form. Additional layers were used until the required thickness was achieved, after which the outside of the mockup was finished to a smooth surface. The urea resin is claimed to provide the ideal surface for finishing and gluing. Lettering and decorative figures were produced separately and were applied to the outer surface of the bell.

Mockups of this kind have previously been made of papier mache, found to be too weak, and plaster of paris, regarded as too heavy. According to Livio Di Nota, head of the Teague development laboratories, this new use of resin and cloth will be employed by his division for all large mockups in the future. He states that the finished product is strong and water resistant, as well as easy to work.

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SLUSH MOLDS

Satisfaction guaranteed . . . or no charge

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Now! Carter introduces its new line of ball-bearing and Oilite Precision Guides for all sized bandsaws. Carter products universally accepted as standard equipment by leading bandsaw manufacturers.




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MODEL	LARGE	MED.	SMALL
BALL BEARING WHEEL	\$15.00	\$13.50	\$12.00
OILITE WHEEL	\$10.00	\$ 8.50	\$ 7.00
SAWS	1/4"-1 3/4"	1/2"-1 1/4"	3/4"-3/4"

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CARTER PRODUCTS COMPANY INC.

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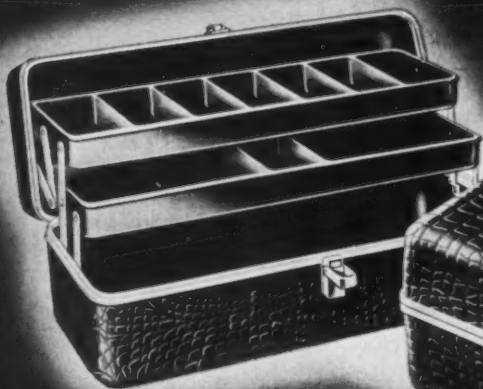


Products bearing the registered trademark "**dag**" originate only with the Acheson Colloids Corporation, Port Huron, Michigan, or with Acheson Colloids Limited, London, England. Acheson supplies dispersed pigments . . . blacks and colors . . . to the plastics and other color-consuming trades. It also is the world's largest producer of colloidal graphite dispersions for the metalworking and electronic industries. The trademarks "Oildag", "Aquadag", "Prodag", "Glydag", "Castordag", "Varnodag" and "Gredag" identify particular products of Acheson Colloids Corporation or its affiliates, and are duly registered in the principal countries of the world.

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**TACKLE BOX IS
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FUNCTIONAL, DECORATIVE THERMOPLASTIC

There is literally no end to the uses of U. S. Royalite, the thermoplastic that dozens of manufacturers use for a wide variety of products.

This remarkable material opens up new design possibilities, either in designing new products, or improving your present products.

CHECK ROYALITE'S ADVANTAGES:

IT IS

Tough
Friendly to Touch
Quiet and Warm
Relatively Light
Shatterproof
Stainproof
Acid Resistant
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IT CAN BE

Sawed—Sheared
Sanded—Punched
Nailed
Bolted—Riveted
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Cemented
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IT IS AVAILABLE

Stiff or Flexible
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Thick— $\frac{1}{2}$ " to Thin— $\frac{1}{32}$ "
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• Smith-Corona Typewriter Case



• Television Mask



• Home Freezer
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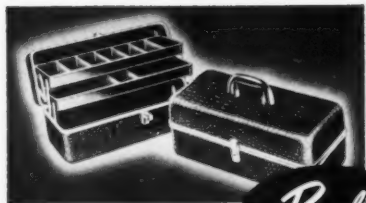
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Reynolds Plastics, Inc., 3445
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Grove S.W., Grand Rapids 2
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16th St., Omaha 9

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Thermacote Co., 329 Jefferson
St., Newark 5
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Durable Formed Products,
Inc., 329 Canal St.,
New York 13
Curbed Inc., 1700 Elmwood
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Dual Fabricators Corp., 808
Driggs Ave., Brooklyn 11
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ONE CUSTOMER
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900

**CORD PLUG
INSERTS
PER HOUR**

with a **MOSLO
DUPLIMATIC***

Minijector

This customer is convinced that a Moslo Duplimatic Minijector molding machine is the only way to get high-speed production of molded cord plugs — and at a minimum labor cost. In fact this same customer after having his first Duplimatic in operation for only two weeks placed an order for a second machine. After operating the second machine for only one week he called and placed an order for his third Duplimatic.

The Duplimatic Minijector is ideally suited for high-speed production for molding any insert. The Duplimatic is all hydraulic and completely automatic. The lower mold section has a complete duplicate set of cavities and is mounted on an automatic positioning bed. A single operator handles all operations. While one mold is being loaded the other mold is closed and receiving an injection charge. Automatic Knockout pins eject molded parts and mold is ready to be reloaded. It is available in 2 oz. and 4 oz. injection capacity with a mold casting area from 20 to 40 sq. inches with an injection pressure of 16,250 to 20,000 p.s.i. We invite your inquiry — write today for further details.

COMPARE OUR SPECIFICATIONS

Guaranteed Production Ratings

- Stainless steel, torpedoes cylinder, Patents Pending.
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- Simple maintenance.
- Positive clamp.
- Greater versatility.
- Fast, even plasticizing.

The Complete Moslo Line Includes:

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- The Moslo Duplimatic Minijector.
- The Moslo No. 60 Plastic Granulator.

* Pat. Pending

MOSLO MACHINERY COMPANY

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NEW MOLDING ECONOMY

for small pieces with LARGE areas

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Model 4 — MACRAY Semi-Automatic Machine
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For those small shot jobs in big molds, there's no need to tie up your larger machines. Mold with maximum economy in the NEW MACRAY 4-oz. machine. Accommodates molds up to 12" x 23", mounted vertically . . . 13 $\frac{3}{8}$ " x 20", mounted horizontally.

And look at these other outstanding MACRAY features . . .

- Simplicity of operation
- Centralized controls
- More efficient cooling
- Longer strain rod bearing
- New longer heating cylinder
- Rugged construction
- Requires minimum floor space
- Prompt deliveries

Write . . . wire or phone for bulletin, price and specifications.

MACRAY ENGINEERING CO.

6611 Euclid Avenue, Cleveland 3, Ohio

A few choice territories are available



Photos courtesy
Hercules Powder Co.

Above: Switch button, dials, inside view of housing.
Right: Deluxe and standard box types

Aerial Control

HOUSING the transformer which operates a new television antenna rotator (designed to eliminate distortion in reception) is a cellulose acetate remote-control box which plays an important role in this T.V. appliance. The box is attractively designed and molded in a rich mottle-brown finish that blends well with home furnishings. It consists of three parts: housing for the electrical assembly; molded pushbutton switch; and dial. The one-piece switch button is also molded of acetate, while the dial, used for indicating the position of the antenna, is transparent vinyl with markings applied by silk screening.

Boxes are available in two types. The deluxe model has a dial on the control box which shows the exact position of the outdoor antenna during rotation, while the standard unit has a dial which lights upon the completion of the rotation cycle.

The control box is molded by The Emeloid Co., Inc., Hillside, N. J., for U. S. Devices Corp., S. Plainfield, N. J. Hercules flame-resistant acetate was chosen for the housing because of its impact strength, durability, and self-extinguishing properties which reduce fire hazards. In tests, the housing proved safe even when the built-in transformer in the control box was deliberately short-circuited. Heavy bosses and reinforcing ribs in the housing provide ample support for the transformer and bottom plate.

PROTECT YOUR PRODUCTS DURING SHIPMENT *with*



S.S. White
PLASTIC DUMMY SHIPPING PLUGS AND CAPS

Hex SOCKET TYPE PLUGS
FOR N.P.T. PIPE THREADS

PLAIN TYPE PLUGS
FOR N.P.T. PIPE THREADS

SHOULDER TYPE PLUGS
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TYPE C CAP NUTS
FOR MACHINE SCREW THREADS
AND N.P.T. PIPE THREADS

Made of tough, non-brittle plastic. Available from stock molds in a wide range of sizes. Details in BULLETIN P-4601. Copy mailed on request.

CONTRACT MOLDING
in all standard thermoplastic and thermosetting materials.

THE S.S. White PLASTICS DIVISION
DENTAL MFG. CO.

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SOMETHING NEW

Important improvements
have been made in the

ATLAS Type "E"

High Pressure Reducing Valve

The new design is shown at the left. Compare it with the design we have been showing in previous issues of MODERN PLASTICS and you will be able to "see" one of the improvements.

Another important improvement, not visible in the picture, is the STELLITING of internal working parts, making them much more durable.

This remarkable valve, as we have been telling you for years, reduces pressures as high as 6,000 lbs. per sq. in. *without shock*. And it handles with the utmost ease—water, oil, or air.

You Can Rely On It

In fact, you can rely on any ATLAS product. ATLAS has been in the regulating valve business for over a half century and positively GUARANTEES every product. In making Type "E", for example, we make the body of the strong-est steel. Internal metal parts are specially protected. A formed packing of special material superior to leather is used which is immune to all fluids commonly used in hydraulic machinery. The pressure on the seat is balanced by a plunger with the result that variations in high initial pressure have little effect on the reduced pressure. Complete data on request.

For other ATLAS plastic plant products see the partial list in our ad in the January 1950 issue of MODERN PLASTICS

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE

277 South Street, Newark, 5, N. J.

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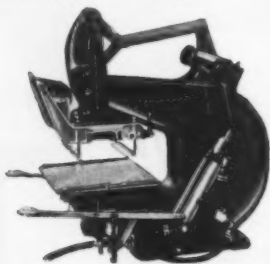
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- increased production
- savings on leaf



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hand and automatic hot stamping machines available for plastics and other materials.

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Compressed air power units compensate for the different overall thickness of plastics. Special make-ready takes care of the waves in plastics.

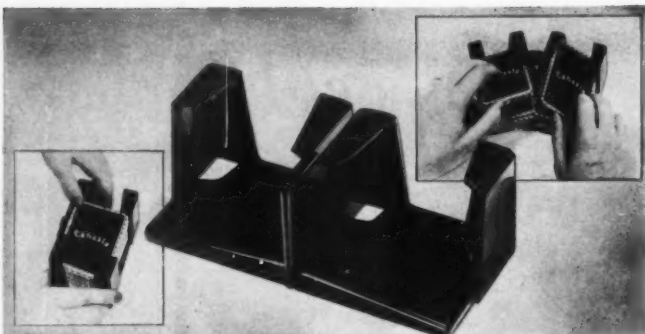
Comparison proves KENSOL a leader in its field. Compare before buying.

Send samples on your long run problems for an estimate on special high speed production presses.

Write for Literature



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Olsen Mark corporation
Kensol Stamping and Embossing
Equipment
128 White St. • New York 13, N. Y.
Established over 25 years



Pair of cellulose acetate wings forms versatile card game accessory which serves first to shuffle pack. Position of hinged sections is then changed, making tray to hold deck

Card Shufflers and Tray

WHEN South America gave us the game of Canasta, card players were presented with the problem of shuffling two decks quickly and easily. Several shuffling devices have appeared on the market—most of them taking advantage of the merits of plastics materials—two of which, described here, are of the folding flap type.

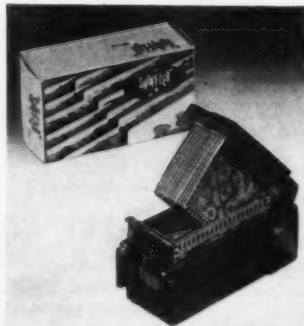
A versatile shuffler, the Shuff'l Tray, has been designed by Multiple Products Corp., New York, N.Y. By changing the position of its two sections, which are hinged together, the device serves first to riffle the pack and then to hold the cards during play. In this latter phase, the two wings, molded of cellulose acetate, are brought together to form a tray. To keep the flaps at the proper angle for shuffling, a flat, molded tab has two slots which fit over the edge of each section. Half a pack is then placed in each side, the decks are riffled, the cards mixed and removed, and the entire cycle repeated as many times as required. This plastic tab can be detached and used as a "freezer" signal during the course of play, indicating that the next player in turn may not pick up the deck. The Shuff'l Tray is currently being marketed in a wide variety of attractive colors.

Another device, capable of handling single, double, or triple decks, is the Shuffler by Permo made by The American Binder Co., Brooklyn, N.Y. The product is molded of sty-

rene and has a felt-padded bottom. Here again, two flaps are involved; in this case, cards are dropped into a holder which is tapped on the table so that half the deck slips into ridges molded into the bottom. This splits the pack into two steps, the lower of which is held in place by raising a positioning arm. Another arm is swung to engage the upper step of cards, then raised, lifting the cards upward. By this simple separation, the deck is cut 40 ways; shuffler is further claimed to be able to cut 108 cards in 10 seconds.

The Shuffler is available in red, blue, green, ivory, and tortoise shell. When not used in the game, the durable, washable device is ideally suited as a container for storing and protecting the cards.

Ridges molded in base of styrene shuffler and swinging arms cut deck 40 ways



Modern Plastics

Shawnee

REG. U.S. PAT. OFF.

DRY COLORS

COLORS FOR PLASTICS

Red & Yellow
Cadmium Toners

Strontium Chromate

Organic Red, Maroon,
Blue & Green Toners

Offerings based on extensive
experience with leading
plastics manufacturers
KENTUCKY COLOR & CHEMICAL CO.
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Now! Feed Small Parts

At Rheostat Controlled Rates

In Oriented Position

Automatically

to automatic

Single File

processing machinery,
inspection belts, etc.

SYNTRON PARTS FEEDERS

—solve a lot of old problems in modern, highspeed production by providing a controlled, constant, uninterrupted stream of parts to automatic processing machines, etc.

Syntron Vibration does the job —smoothly and gently moving the parts up and around the spiral track, with selectors orienting the parts to their desired discharge position.

Send us samples of the parts you're working. Our Engineering Dept. will be glad to make tests and submit recommendations and quotations.



SYNTRON CO.

390 Lexington Ave.

Hamer City, Pa.

**Specifically
DESIGNED**



**for LABORATORY
SERVICE**

This compact, 30-ton, self-contained hydraulic platen press is specifically designed for the exacting service of the laboratory. Accurate, versatile and easy to use, it is one of many types manufactured by R. D. Wood for laboratory service.

The press operates under a maximum working pressure of 2,200 psi, has an 8" ram stroke, a 24" press opening and occupies a floor space of approximately 4' x 4'. The press platens, measuring 12" x 18", may be either steam or electrically heated. The press is equipped with an elevator for raising and lowering molds from the bench to press platens.

Write, without obligation, for information on this and other R. D. Wood hydraulic presses for plastics.

HYDRAULIC PRESSES AND PLASTIC PRESSURE EVERY PURPOSE
ACCUMULATORS, REGULATORS, INTERMEDIATES



R.D. Wood Company

Est. 1893

PHILADELPHIA, PENNSYLVANIA U.S.A.



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INJECTION
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a new hot melt elastomeric

A flexible and non-toxic vinyl base compound, Plastiflex has unlimited applications in the manufacture of your products. Investigate the advantage of this new low cost material today.

Write now for complete information on Plastiflex. Our research laboratories will work with you in developing compounds for specific applications.

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- Excellent electrical properties
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- Unlimited color range
- Simplicity of production

CALRESIN CORPORATION

8564 Washington Blvd. Culver City, Calif.

30-Foot Tower

TESTING aircraft antennas is accomplished with greater accuracy on a new 30-ft. tower, since the 300-lb. structure is made of plastic which, being non-magnetic, eliminates any possibility of confusing radio interference. Lincoln Industries Inc., Marion, Va., produced the tower for Airborne Instruments Laboratory, Mineola, N.Y.

The main tower assembly and the 6-ft. boom on which the model plane is swung were formed on male sheet-metal molds. The inner face of the tower, consisting of four layers of Fiberglas cloth, was laid up with a core of 5/8-in. Valinite-impregnated honeycomb, using Plaskon 911-11 resin. The Fiberglas cloth was first placed on the mold, after which the honeycomb was wrapped around and tied in place before applying the impregnated fabric for the outer face, which was held with wide rubber banding while the entire lay-up was cured in a large autoclave at about 180° F for 48 hours.

The resulting tower is extremely rigid due to the honeycomb walls, while the resin and Fiberglas reinforcement make the structure weather-proof. Fiberglas-reinforced plastic was also used to produce internal control tubes and for the airplane model.

Rigid testing tower of resin-impregnated cloth is weather-proof, non-magnetic



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WAREHOUSES: Jersey City • Akron • Boston • Los Angeles • Memphis



Here's a sound investment in longer service life—lower maintenance costs. Write for complete information.

331 W. WATER ST., SYRACUSE 4, N. Y.

139

New Magazine Will Sell Plastics to Nation's Retailers

55,000 Plastics Buyers To Get First Issue of "Plastics Merchandising" Next January

NEW YORK, N. Y., Nov. 9.—"Plastics Merchandising," a new monthly tabloid-style magazine aimed at an important retail market hitherto unserved by any journal of its own, will begin publication in January, 1951, it was recently announced by Charles A. Breskin, president of Breskin Publications and publisher of "Modern Plastics" and "Modern Packaging" magazines.

With a guaranteed minimum circulation of 55,000 copies directed to buyers of all types of plastics merchandise in variety, chain, department, drug and other large volume retail outlets, the new magazine will provide a complete monthly picture of new plastics items, of currently successful retail plastics promotions and of newly developed merchandising techniques. This editorial pattern has been tailored to fit the special needs of buyers as shown by surveys in New York, Boston, Detroit, San Francisco, Chicago and other major retail centers.

The reading needs of buyers also dictated the new publication's handsome format that combines the news and feature ar-

rangements of a newspaper with high quality paper and full-color printing.

Industry Pledges Support

Representative companies in the plastics industry have been quick to endorse the objectives of the new publication. In many cases the support has taken the form of large scale advertising campaigns. Formal contracts for full advertising schedules have already been placed by sixty leading companies including plastics material manufacturers, proprietary molders and plastics film converters.

Full Details Available

Manufacturers of plastics products can obtain complete details about the market provided by "Plastics Merchandising" and its advertising rates by writing to Advertising Department, Plastics Merchandising, Inc., 122 East 42nd Street, New York 17, N. Y.



Photos courtesy Bakelite Div.

Calendar illustration and lettering can be changed to suit the customer

Three-Dimensional Displays

EFFECTIVE low-cost merchandising is given a boost by three-dimensional calendar and counter displays produced of formed Vinylite sheet by Timely Products Mfg. Co., Fort Des Moines, Iowa. Light in weight, the material is durable, resistant to abrasion, grime, and rough handling, and can be easily cleaned with soap and water.

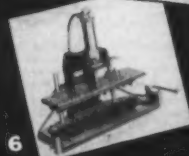
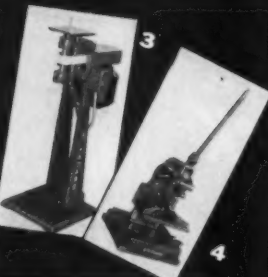
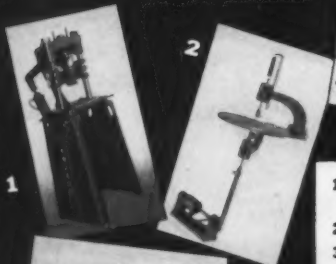
The full color illustration and name plate on the calendar can be interchanged with other scenes and lettering as demand dictates.

The calendars and displays are made to fit specific requirements. Sizes for calendars range from 3½ by 5 in. to 12 by 18 inches. Displays are from 2½ by 4 in. to 18 by 24 inches.

Counter display brand name plate is easily kept bright and clean



Plastic or Celluloid Fabricating Equipment



- 1 FOUR TON, AIR OPERATED TOGGLE PRESS
- 2 POWER JIG SAW
- 3 BEVELER
- 4 HAND LEVER PRESS
- 5 ELECTRIC STEAM TABLE
- 6 DEGATOR

Designers and builders of INJECTION MOLDS

STANDARD TOOL CO.
#3 WATER STREET, LEOMINSTER, MASS.

Outfitters to Plastics Mfrs. Since 1911

OMNI PRODUCTS CORP., Export Distributors, New York, N.Y.

• MANUFACTURERS' LITERATURE •

To obtain any of the booklets or catalogs listed below, simply circle the corresponding number on the post card, fill in the information requested, and mail.

MATERIALS

FORMICA AT WORK. Catalog on industrial grades of Formica features comparator chart on major characteristics of 50 separate grades. 12 pages. The Formica Co. (12-1)

RESIN. The properties solubility, compatibility with drying oils, compatibility with other resinous or plastic materials, and uses of Durez 220 resin (terpene phenolic, oil-soluble, high-melting, low-viscosity, thermoplastic resin) are given. 10 pages. Durez Plastics & Chemicals, Inc. (12-2)

ARWAX CONCENTRATES. Description of the improvements imparted to paraffin and microcrystalline waxes by the addition of polyethylene, butyl, and S-polymer concentrates. Includes applications and methods for handling these concentrates. American Resinous Chemicals Corp. (12-3)

PLIOVIC RESINS. Thorough examination of the general properties, compounding components, process techniques, and applications for Pliovic vinyl chloride copolymers Chemicals Div., The Goodyear Tire & Rubber Co. (12-4)

KOPPERS ADHESIVE FOR POLYSTYRENE. This two-page technical bulletin describes the uses and methods of application of Koppers adhesive for polystyrene together with storage, handling, and shipping information. Chemical Div., Koppers Co., Inc. (12-5)

CARBON BLACKS. Analytical properties, processing behavior, tests on vulcanizates, and tabulated data on carbon blacks in natural and synthetic rubbers. Godfrey L. Cabot, Inc. (12-6)

PLASTICIZERS. Technical data relating to the Aero dioctyl phthalate plasticizers, including physical properties of pure compound, specifications, evaluation for vinyl resins. American Cyanamid Co. (12-7)

FIBERGLAS REINFORCEMENTS. Sheaf of leaflets containing information essential for those who use Fiberglas materials for reinforcing plastics. Owens-Corning Fiberglas Corp. (12-8)

PLASTICIZERS. Complete data including specifications, physical properties and compounding formulas of Polyfizier 162 (DOP) and Polyfizier 332 (DOA). 16 pages. Harwick Standard Chemical Co. (12-9)

COATING RESINS. Technical sheets listing typical characteristics of alkyd resins, urea and melamine resins, maleic resins, phenolic resins, and ester gums. Plaskon Div., Libbey-Owens-Ford Glass Co. (12-10)

LAMINATED INSUROK. Data sheet containing electrical, physical, and hot punching characteristics of a paper base laminated phenolic with applications in the television and electronics industry. The Richardson Co. (12-11)

REZ-N-BRAND PRODUCTS. Cold dip dyes, hot dip dyes, synthetic enamel coatings, cleaning solvents, and glues and cements for various plastics are described in this booklet. 14 pages. Schwartz Chemical Co., Inc. (12-12)

MOLDING

MOLDS FOR PLASTICS. Illustrated four-page booklet showing various molds and plastic fabricating equipment offered by Standard Tool Co. (12-13)

"CRONING" PROCESS. A step-by-step photographic description of the "Croning" process for producing foundry molds and cores using Bakelite phenolic resins. Includes advantages of the process and information on materials. Bakelite Div., Union Carbide and Carbon Corp. (12-14)

BERYLLIUM COPPER CASTING. Catalog gives technical information on casting under pressure for fabrication of cores and cavities for plastic and rubber molds. Manco Products Co. (12-15)

MOLDING OF TEFLON. Detailed coverage of the special techniques necessary for molding Teflon tetrafluoroethylene resin is given in this informative booklet. E. I. du Pont de Nemours & Co., Inc. (12-16)

MOLD STEEL. The type analysis, description, strength, production information, etc. on Stainless No. 2 mold steel, which gives corrosion resistance, are provided. Also included are answers to questions frequently asked about heat treating and finishing mold cavities. Six pages. The Carpenter Steel Co. (12-17)

PRODUCTION EQUIPMENT

SCRAP GRANULATOR. Bulletin describing the Van Dorn scrap granulator for rigid thermoplastic scrap. Features, specifications, and illustrations are included. The Van Dorn Iron Works Co. (12-18)

HYDROLAIRS. Advantages, specifications, features, and other information on Elmes Hydrolairs, power operated production presses that have neither motors nor pumps. Four pages. Elmes Engineering Works of American Steel Foundries. (12-19)

HEATING PLATENS. Steam heated or water cooled platens and electrically heated platens are described. Range of sizes, parallelism, uniform heating distribution, and other information are presented. R. D. Wood Co. (12-20)

INJECTION MOLDING MACHINES. Collection of eight ad reprints which point out the advantages of Reed-Prentice injection molding machines. Reed-Prentice Corp. (12-21)

MANUFACTURERS' LITERATURE DEPARTMENT MODERN PLASTICS

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• MANUFACTURERS' LITERATURE •

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INJECTION MOLDING MACHINE. The features of the Windsor 3-oz. injection molding machine are completely covered in this folder. R. H. Windsor Ltd. (12-22)

ROTOCURE. Illustrated brochure describing the advantages and applications of the Rotocure machine for continuous vulcanizing or laminating of plastic material in sheet form. Four pages. Farrel-Birmingham Co., Inc. (12-23)

CONTINUOUS MIXING. The "Entoleter" continuous mixer and its advantages, together with specifications and diagrams, are presented in this four-page folder. Entoleter Div., The Safety Car Heating and Lighting Co., Inc. (12-24)

BATCH BLENDERS. Rotary batch blenders for precise mixing of particles of varying weights, densities, and fineness are described. Four pages. Sturtevant Mill Co. (12-25)

ELECTRONIC SEALING AND HEATING. Folder containing a series of data sheets which list a range of heat-sealing equipment for sealing thermoplastics and for heating preforms. Thermostat Div., Radio Receptor Co., Inc. (12-26)

FIBRE GLASS SUPER-HEATERS. Descriptive booklet on custom built radiant heating panels for pre-heating, curing, heat setting, and other applications. Still Industries. (12-27)

CENTERLESS GRINDING MACHINE. Advantages and specifications of the Cincinnati Filmatic No. 2 centerless grinding machine for producing close-tolerance ground shapes are given. Eight pages. Cincinnati Grinders, Inc. (12-28)

CALENDER. Description of the advantages and economies possible with the new Adamson United precision calender. Compares specifications of old- and new-type calenders. Adamson United Co. (12-29)

MISCELLANEOUS

THERMOCOUPLE CONNECTORS AND PANELS. Booklet describing several styles of quick-coupling connectors for thermocouple materials as well as connector panels for simplified checking of many thermocouples at a centralized control. Thermo Electric Co., Inc. (12-30)

BAND SAW GUIDE. Described in this four-page folder is the Carter Micro-Precision Guide for supporting band saw blades so they last longer and operate more efficiently. Carter Products Co. (12-31)

PUNCH STOCK HEATERS. Application report on use of Chromalox RAD heaters for maintaining temperature of punched stock between pre-heating oven and punch press. Edwin L. Wiegand Co. (12-32)

MACHINE SHOP SERVICE. Illustrated folder discussing machine shop facilities for both emergency and routine repair or regular contract work. Barker-Davis Machine Co., Inc. (12-33)

LIQUID FILTERS. Marvel Synchronal filters for removing cuttings and foreign matter from circulating oil and other fluids used in coolant hydraulic, and similar systems are described in this eight-page booklet. Marvel Engineering Co. (12-34)

ENGINEERING PROPERTIES OF NICKEL. Technical data on wrought and cast nickel, physical constants, mechanical properties, and resistance to corrosion. Includes working instructions. International Nickel Co., Inc. (12-35)

MACHINING AND FINISHING POLYSTYRENE. The most efficient techniques for drilling, sawing, threading, printing, annealing, and punching polystyrene are covered in this informative booklet. Monsanto Chemical Co. (12-36)

AIR CYLINDERS. Eight-page booklet contains engineering data, mounting drawings, and specifications for various models of Miller high efficiency air cylinders. Miller Motor Co. (12-37)

SCALES. Described in this broadside folder are a wide range of weighing scales, many of which have numerous applications in the plastics industry. Toledo Scale Co. (12-38)

TEMPERATURE INDICATORS. Description of a new line of cold-end compensated thermocouple thermometers and resistance thermometers for temperature measurement in drying ovens, industrial furnaces, and other applications. Eight-page booklet. General Electric Co. (12-39)

POLYETHYLENE BOTTLES. The advantages and decorating possibilities of polyethylene bottles, and the considerations necessary when designing them are discussed. Eight pages. Plax Corp. (12-40)

SEALER FOR POLYETHYLENE. Description of the new Amco hand sealer which eliminates the problem of the material sticking to the sealing iron. Amco Packaging Machinery, Inc. (12-41)

HYDRAULIC SYSTEM. The advantages and layout of a central hydraulic system for operation of hydraulic presses, using either a variable- or a constant-stroke Aldrich pump are outlined in a mailing piece. The Aldrich Pump Co. (12-42)

VIBROFAD MOUNTING. Booklet describing special rubber pad mountings for reducing shock, noise, and vibration caused by operation of machinery. B. F. Goodrich Co. (12-43)

THERMOCOUPLE MANUAL. New 42-page Wheelco data book and catalog containing prices, applications, recommendations, and pertinent information concerning instrument-sensing units and accessories. Wheelco Instruments Co. (12-44)



BUSINESS REPLY CARD

First Class Permit No. 2686 (Sec. 34.9, P. L. & E.), New York, N.Y.

MODERN PLASTICS

122 East 42nd Street

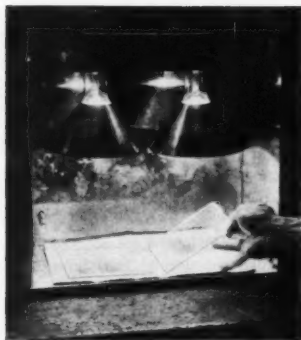
NEW YORK 17, N. Y.





Air pressure for demonstrating fabrication of heated acrylic sheet by the blowing method is supplied by an ordinary hand-operated bicycle tire pump, shown at the left. Work table serves to house the various parts of the equipment during transportation

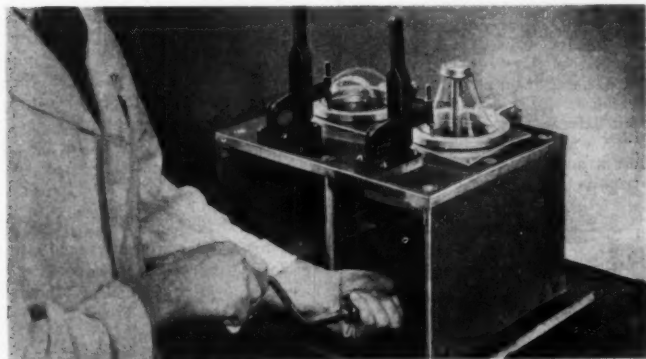
Acrylic Fabricating Demonstrator



Oven for demonstration of acrylic-forming methods is heated by infra-red lamps

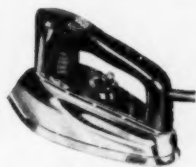
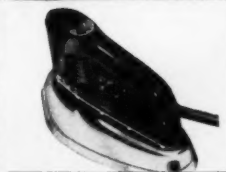
METHODS of fabricating Perspex acrylic sheet can be graphically shown on a small demonstration unit designed by Plastic Div., Imperial Chemical Industries, Ltd., England.

The equipment consists of an oven with infra-red lamps and a small bench or table, on which are mounted two clamping rings: one for demonstrating the forming of heated acrylic sheet by blowing, and the other to show how deep pressing is done. Electrical power for heating is all that is required on the spot, since a tire pump supplies compressed air and an auto jack provides the thrust for press forming. Parts are packed under the bench in transport.



In demonstration of press forming of acrylic sheet, thrust is obtained from automobile jack. Clamping rings on bench top are for blowing (left) and pressing (right) methods

**WELL-HANDLED
by SHAW**



Gauge-maker's precision was applied by Shaw in molding five separate pieces in the handle for the Presto steam iron. Perfect fit required — perfect fit provided.

Smart, comfortable handle is typical of the high quality work Shaw is equipped to produce with speed at low cost.



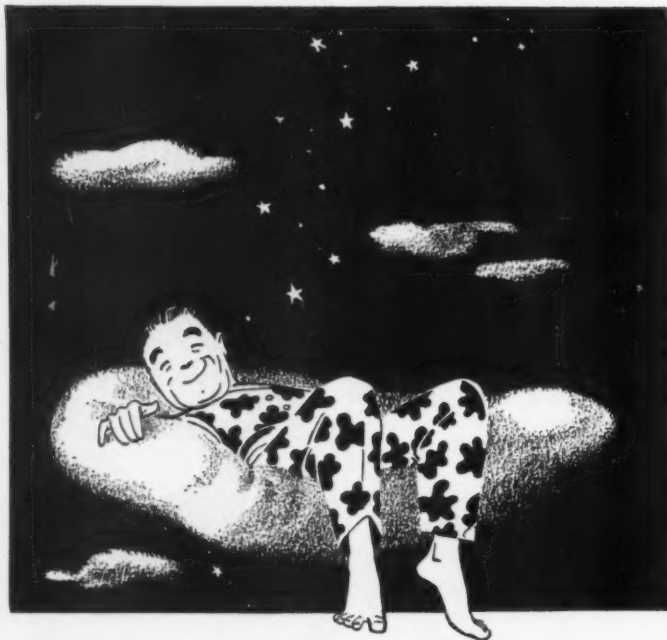
SHAW INSULATOR CO.

MOLDERS



SINCE 1892

140 COIT ST., IRVINGTON 11, N.J.



FOR SALE

Restful Nights FOR VINYL MANUFACTURERS

NOTHING TO IT!

Vinyl formulations not meeting your usual high requirements? Here's how to keep from "tossing and turning" on into the morning! First, isolate your vinyl processing troubles. Check uniformity of the raw materials you are using. If this doesn't help and your batch is formulated for correct stabilization, the variable may be the stabilizer you are using.

Maximum activity and top-notch results are obtained *only* when stabilizers are selected with an eye to the processing of *specific* resins and plasticizers.

HERE'S HOW YOU BENEFIT

When you standardize on Ferro Stabilizers, you get more sleep. And—in addition, you set up for future vinyl processing a flexible, complete line of stabilizers of single metals as Barium, Cadmium, Lead, Strontium, Calcium or of Pure Organics or Phosphate. Often we recommend *combinations* of these stabilizers in ratios and concentrations to yield maximum utility in your *specific* formulation. Like more information? Write. Samples and data will be forwarded promptly.

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CHEMICAL CORPORATION
BEDFORD, OHIO



A COMPLETE LINE OF... VINYL STABILIZERS • METALLIC SOAPS • DISPERSING AGENTS • SURFACE ACTIVE AGENTS • DRIERS • COBALT COMPOUNDS

S. P. I. Conference

(Continued from p. 74)

Business Review, was "Creative Effort in Industrial Marketing." In marketing a product, Mr. Bursk said, you can take nothing for granted, no matter how good your specific product is and no matter how well established may be the market demand for that type of product. Because human beings and human reactions are so variable and unpredictable there is scope for creative effort—opportunity for the industry to out-distance competing industries and opportunity for individual manufacturers in the industry to gain either larger or more profitable shares of the industry's market.

Mr. Bursk selected four areas of decision-making in the marketing process which he believes are most likely to offer a rich opportunity for creative effort: 1) There should be a real potential market demand for the product; 2) Do not take price of a product for granted as something determined by manufacturing costs; 3) You have to determine the proper mix of advertising, direct mail, and personal selling that fits your specific product; 4) In selling your product, meet the purchaser on his own ground—in terms of solving the buyer's own problems.

Neil H. Borden, Professor of Advertising, discussed "Satisfying the Consumer," pointing out that the consumer relies on the following means to make certain that he gets the products that will satisfy him: 1) The brand name of some fabricator; 2) The brand of a materials or parts manufacturer; 3) The retailer from whom he buys; 4) His own judgment of the worth of the product.

For some materials consumers can develop skill in judging materials and workmanship, but when the qualities of the products they buy are hidden (as in plastics products) and cannot be judged at time of purchase, consumers are particularly inept.

Injection Molders Meeting

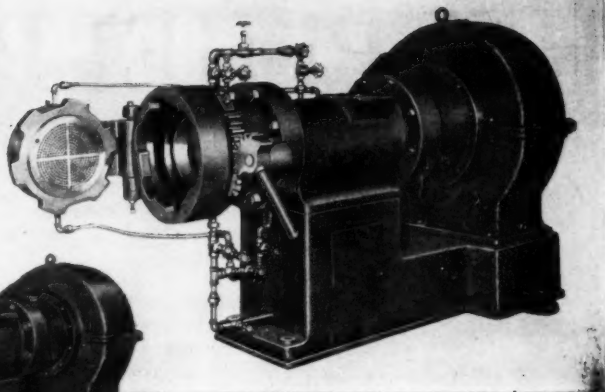
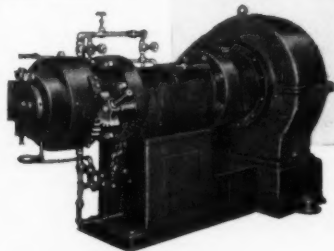
A most interested audience attended the injection molders session presided over by A. N. Williams, General American Transportation Corp.

First speaker was Stanley R. Melvin, Monsanto Chemical Co., on the subject "Improvement of Thermo-

6" Strainer

WITH SLABBING HEAD

Here is just another of the many examples of National-Erie design . . . the result of nearly a half century in engineering and producing machines for rubber and plastics working. Mechanical features are incorporated in NE strainers which have always resulted in year in year out operation at lowest cost. Let us consult with you on your rubber or plastics machine needs.



ABOVE: 6" strainer with combination slabbing head in open position.

LEFT: 6" strainer with combination slabbing head in closed position.

Complete Rubber and Plastics Working Machinery



NATIONAL ERIE CORPORATION

ERIE, PENNSYLVANIA • U. S. A.

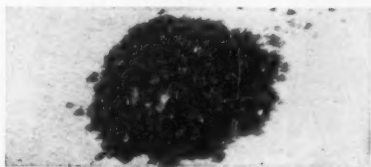


NE

IS THIS YOUR PROBLEM? SPRUES AND GATES



— TO —



USABLE GRANULES

M & M Engineers have solved this problem with a new granulator for "on the job" grinding. No scrap to dispose of or store after run is completed. Write for complete details.

MITTS & MERRILL

1016 SOUTH WATER • SAGINAW, MICHIGAN

Miccosol

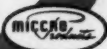
A superior Vinyl Plastisol developed and manufactured to your specifications by MICHIGAN CHROME & CHEMICAL COMPANY.

MICCROSOL is specially formulated for a wide variety of coating applications as molding, dipping, etc. It is ideal for slush molding of toys and other suitable flexible objects; as well as a coating material for gloves, fabric, wire goods and packaging protection.

Our engineers will be glad to help you with your molding or coating applications. Write for consultation on your problem.

MICHIGAN CHROME & CHEMICAL COMPANY

6342 East Jefferson Avenue
Detroit 7, Michigan



HELP! HELP!

... that's all we can give you

Due to current spot shortages in materials, we are not able to accept orders from new customers for pigment roll leaf, aluminum roll leaf or imitation gold roll leaf.

... but we still can assist you. Bring your plastics marking problems to the attention of our technical staff. They will do their best to show you how to achieve best results despite limited materials. Please do not hesitate to ask for our help. No obligation.

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- Creative Service in Product Development
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- Over a Century of Fine Tool Work
- Finishing, Assembling, Packaging

Our technical staff will gladly confer with you
Write for Waterbury Plastics Catalog

WATERBURY COMPANIES, INC.
South Main St. Waterbury, Conn.

plastic Products by Post-Molding Treatments." Mr. Melvin gave a detailed presentation of the various techniques of decorating molded plastics products along the same lines as the presentation in the lead article in MODERN PLASTICS, November 1950. In addition, he discussed the reasons for and the methods used in annealing, in metallizing, and in other treatments designed to produce better and more saleable thermoplastic molded products.

G. D. Gilmore, The Dow Chemical Co., spoke on "A Study of the Mold Pressure Cycle," showing the relationship between time, temperature, and pressure in the establishment of an economical and satisfactory cycle and the relationship between gating methods, sprue, and mold design to materials.

In discussing preplasticizing and what it means to the plastics industry, W. G. Whitehouse, Crown Machine & Tool Co., stated that Jackson & Church Co., The Watson-Stillman Co., and Crown all furnish preplasticizing equipment.

He listed the following advantages resulting from preplasticization of material in injection molding: 1) Lower pressures; 2) More uniform heat; 3) Less clamp per square inch of projected area; 4) Faster injection speeds; 5) Greater projected areas; 6) Uniform molded parts; 7) Less tendency for parts to stick in molds; 8) Cheaper mold costs; 9) Molded parts have less internal stress and strain.

S.P.I. Departmental Luncheon

Horace Gooch, Jr., Worcester Molded Plastics Co., and president of S.P.I., presided at the Friday luncheon which was addressed by Maj. Gen. Hugh Johnston Knerr, U.S.A.F. (ret.); his subject, "Russia."

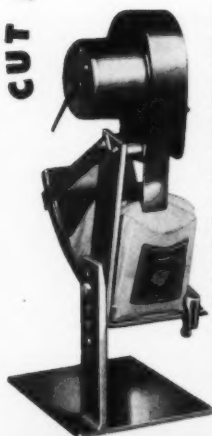
Correction

It has been brought to our attention that the "Eye Catchers" described on page 143 of our August issue are not manufactured by Hewig Co., as stated, but are marketed by that company and purchased from the manufacturer, A G P Corp., Peru, Indiana. The styrene used is supplied by Gering, Koppers, and Monsanto.

CUT PACKAGING TIME...

WITH
THIS

FASTER BAGGER



The Anderson Bagger, Model 134, is designed to handle bagged products at a fast rate with a minimum of effort. Simple adjustments for height and tilting forward or backward enables the operator to set the machine at the most advantageous position. He can fill the bag and place it in the carton in one operation. The stainless steel bag trough, capacity 200 bags, may be loaded from front or back. Simple adjustments for bag sizes. Blower, equipped with air filter, opens bag and keeps it free from foreign matter.

Send Today
for
Bulletin
No. 12-31



ANDERSON BROS. MFG. CO.
ROCKFORD, ILLINOIS



**NEW
LABORATORY
MILL**

6" x 12" with Anti-Friction Bearings

THE laboratory mill illustrated above was expressly designed as a precision mill for operation at high temperature (650° F).

A self contained lubrication system circulates oil through the roll journal bearings. The use of piston ring type oil seals eliminates oil leaks and the frequent replacement of rubber-based oil seals. Write for specification folder.

Capacity of mill: 2 to 3 pounds
Space required: 28" wide, 60" long.

West Coast Reps: H. M. Royal, Inc., 4814 Loma Vista Ave., Los Angeles, Cal.
Export Agent: Steinhilber & Nardlinger, 105 Hudson St., N. Y.

THROPP
WM. R. THROPP & SONS CO. Trenton, N. J.



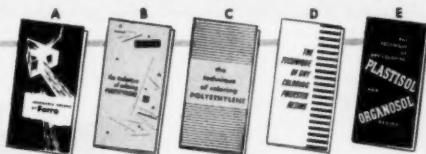
**MOST ANY
COLOR
YOU WANT!**

**... ready for molding
in 15 to 20 minutes**

Processing polystyrene—polyethylene—or polyesters? Watch sales volume zoom as soon as you tag, "available in most any color," on your next production item. Here's all you do. First, purchase uncolored resins...you'll save, in some cases, as much as \$8.00 per 100 lbs. of resin, by this change. Second, standardize on Ferro's Dry Colorants. Not only economical, these pigments are really simple and easy to use. No special equipment, no special training of personnel is required. Available as base colors or in blends. Ferro pigments are compatible with the plastic. They will not streak or "bleed"; ground fine, Ferro pigments disperse readily. Check the coupon below. Mail it today! A trial in your plant is our best evidence that Ferro Dry Colorants can save you money, give you a variety of production-proved colors fast!

**EVERY PLASTICS USER WILL WANT ONE OF THESE
HELPFUL BOOKLETS**

- Inorganic Colors by Ferro
- The Technique of Coloring Polystyrene
- The Technique of Coloring Polyethylene
- The Technique of Coloring Polyesters
- The Technique of Coloring Plastisols and Organosols



FERRO ENAMEL CORP.
4160 East 56th Street
Cleveland 5, Ohio

Rush Free Test Sample of _____ (color) For _____ (name of plastic)

Mail Without Charge Bulletins (check)

☐ a ☐ b ☐ c ☐ d ☐ e

Name _____ Title _____

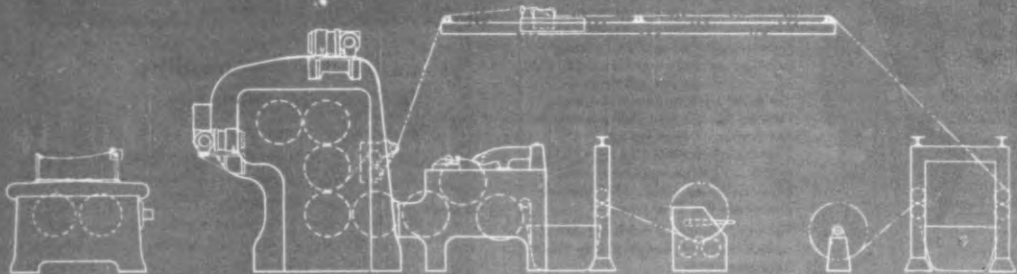
Company _____

Address _____

City _____ Zone _____ State _____

Continuous Processes

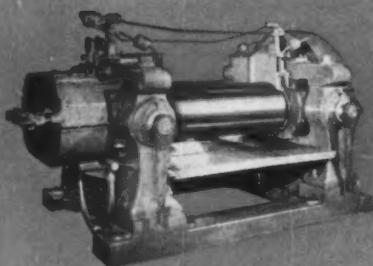
FOR RUBBER AND PLASTICS



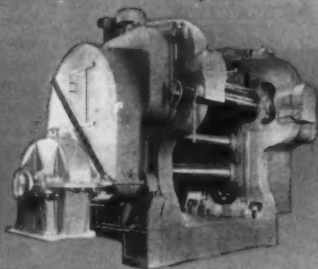
Continuous Calendaring Process for Supported or Unsupported Plastic Sheet.

Equipment includes fabric let-off stand with accumulator spray, fabric centering device, fabric pre-heating rolls, four-roll Calendar, cooling rolls, and fabric wind-up with accumulator spray. Also

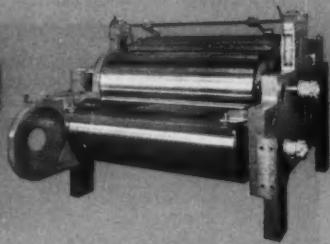
included are facilities for trimming and winding up unsupported sheet. A stock warming up mill is included, with stock transfer feeding conveyors as required.



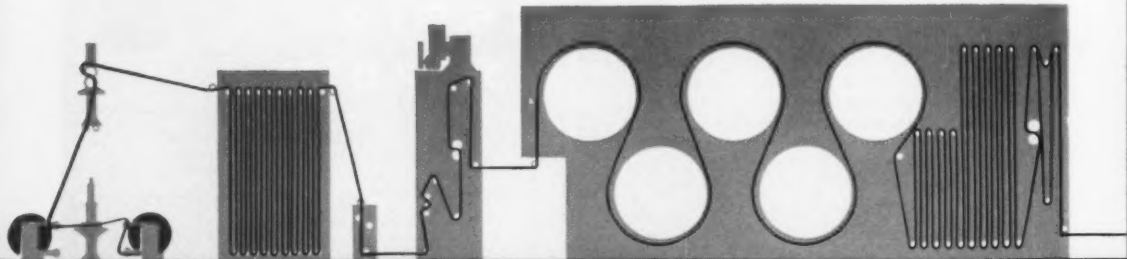
Warming and mixing mill for plastics, 22" x 22" x 60", equipped with oil feed lubrication system, high pressure rotary joints, and tiltable stock guides.



Four-roll Calendar for plastics, 24" x 68", including oil feed lubrication system, bored rolls, adjustable stock guides, high pressure rotary joints, motorized two-speed roll adjustment, and hydraulic roll stabilizing equipment.



Film and Fabric Cooling Roll Unit, with film trimming and wind-up device for mounting at the Calendar.

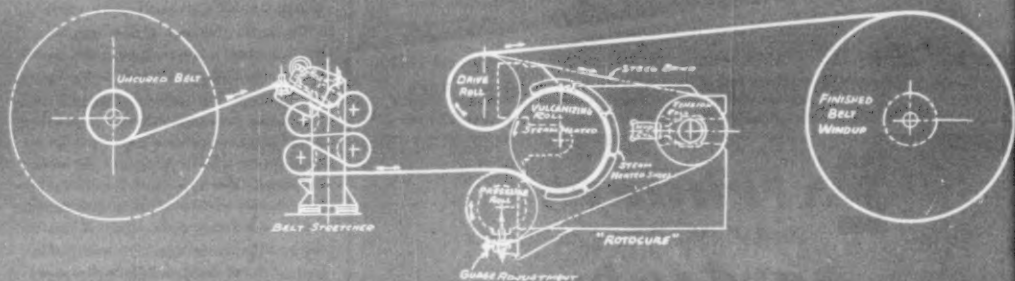
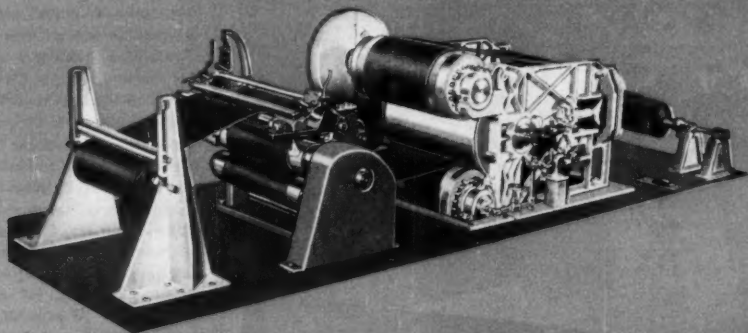


Continuous Tire Fabric Processing Unit.

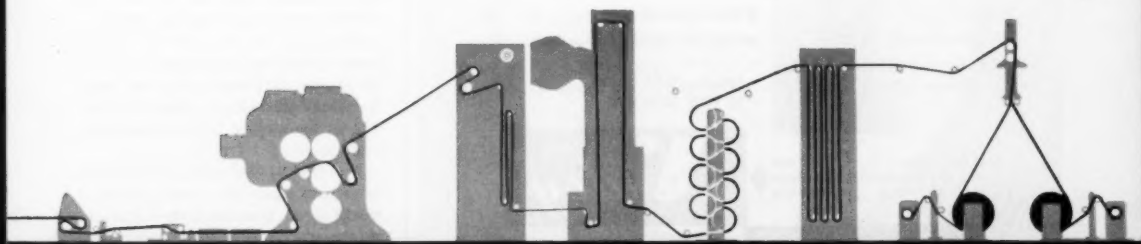
This double coating train includes pre-dipping, drying, calendaring, cooling, and wind-up equipment.

We engineer, build and install continuous processing equipment for the manufacturer of rubber or plastics products. Your inquiry concerning special or unusual requirements is invited. Our engineers are available for consultation.

Improve product quality - lower product cost



"ROTOCURE" Process for Continuous Vulcanization of Belting and Floor Matting.
The stretcher is not used when running matting. Built under license from Boston Woven Hosiery & Rubber Company.



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AKRON, OHIO

SUBSIDIARY OF UNITED ENGINEERING & FOUNDRY COMPANY

Branch Offices in Principal Cities

PHENOPREG MATERIALS

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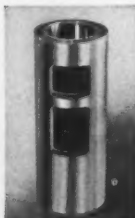
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Freight Cars

(Continued from pp. 64-65)

the cars knocked down for assembly at a distant point, such as at an overseas military base.

Impregnated Wearing Surfaces

All the plywood skins in the Unicel except the car floor have phenolic-impregnated 2-ply paper surfaces bonded to them during lamination. A masking sheet is made by Crown Zellerbach Corp., San Francisco, Calif., by the beater addition of Synco 721 phenolic resin to kraft pulp. The function of this sheet is to prevent show-through of the wood grain. The surface sheet is made of white or colored paper saturated with Synco 418 low-cure phenolic resin.

The plywood assembly, the masking sheet, and the surface sheet are pressed at 150 to 175 p.s.i. and 300° F. for 8 to 10 minutes. A polished stainless steel or chrome-plated caul is used over the decorative surface.

Through the use of the phenolic-impregnated paper sheets, the need for surface maintenance is virtually eliminated. No paint is needed because the permanent color is molded in. The phenolic-impregnated paper is also considerably more abrasion-resistant than the best paint. It can be cleaned with ordinary detergents and can be steam-sterilized if necessary. The surface is completely water-proof and provides an impervious moisture barrier. It is smooth and free of cracks in which dirt can lodge or on which snow and sleet can build up. And with all these advantages, the plastic surfaces cost less than a good paint job!

The decorative plastic surfaces can be made in virtually any color, and car markings (such as the lettering on the sample car) can be made an integral part of the surface. This is done during the laminating operation by laying on lettering die-cut from the same phenolic-impregnated paper as the surface but in a contrasting color.

In view of the current shortages of critical materials, such as steel, it is significant that the Unicel achieves its superior durability and performance with a saving of 11 tons of steel per car. There are only 9 tons of steel in the Unicel, and nearly all of it is to be found in the trucks, brakes, and wheels—END

Molding

(Continued from pp. 83-88)

molded of Teflon, that it is a relatively flexible material as compared to most plastics. Hence its ability to conform is exceptional, and this makes close clearances and tolerances unnecessary.

Finished articles can be molded directly from Teflon powder provided the design is relatively simple and free of offsets. The procedure is to preform the powder into essentially the desired shape at room temperature, remove the piece from the mold, bake at about 690° F. until entirely heated through, and finally "coin" the piece by pressing it into the final shape while still hot. Coining is essential to close control of final shape and dimensions and can be omitted only when these factors are not critical, as mentioned below.

A fused piece as it comes from the oven will be larger than the original preform because of thermal expansion, the linear expansion being 6 to 7 percent. To be able to get the piece into the coining die, the cold preform, then, must be smaller in the dimension perpendicular to the axis along which it is placed in the die, unless it is a tapered shape that can be forced into place by the plunger. To compensate for the small lateral dimension, the height of the preform will usually be made greater than the depth of the coining die.

Some latitude in design of the preform is permitted by the fact that the density of the preform can be varied by variation in the molding pressure. Pressures over the range of 2000 to 10,000 p.s.i. have been used, but a pressure of about 4000 to 5000 p.s.i. appears to be the best.

After removal from the mold, preforms are baked in an electrically heated forced-draft hot-air recirculating oven maintained at 690° F. A rough rule for baking time is 2 hr. per ¼-in. of thickness.

It is sometimes more convenient to bake the preforms by submerging them in a bath of molten heat transfer salt. An electrically heated tank filled with a stable salt such as "Hitec" heat-transfer salt (E. I. du Pont de Nemours & Co., Inc., Explosives Dept.) is inexpensive and



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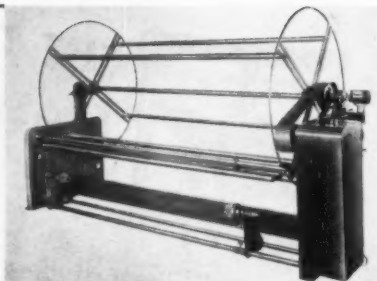
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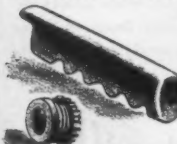
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can be easily maintained at 690° F.

On removal from the oven or bath the pieces are transferred as quickly as possible to the coining die. The coining pressure is not critical; 2000 p.s.i. is generally adequate, but depends upon the amount of deformation being undertaken. The coining die is usually water-cooled, and the hot molding is kept in the die only long enough to chill it. The time will depend upon the thickness of the piece, but will generally be on the order of from one to two minutes.

The piece will shrink after removal from the coining die. While the major portion of this shrinkage takes place during the first hour, complete equilibrium will not be reached for several days. The extent of the shrinkage is very difficult to predict, since it is dependent on the thickness of the piece and the coining cycle. It is of the order of 2½%, or 0.025 in. per linear inch. Lengthening the cycle and increasing the pressure tend to reduce shrinkage.

Small simple shapes, such as washers and packing rings, have been molded by simply baking a preform, and omitting the coining. In general, dimensions are quite difficult to reproduce by this method. The thickness dimension, i.e., the dimension parallel to the direction of applied pressure in preforming, tends to increase. In the direction perpendicular to the applied pressure, the articles will shrink by an amount of 1 to 5%, and shrinkage will decrease with increasing pressure.

The economy of avoiding coining is obvious, and the dimensional tolerances that can be held without coining are certainly adequate for some uses. Even a simple machining operation to touch up critical dimensions will often be cheaper than coining.

Good ventilation should be provided in the area where Teflon tetrafluoroethylene resin is baked. It is hazardous to breathe the small amounts of gaseous decomposition products that are given off by the polymer when heated to the gel state. The baking oven should be vented to the outside of the building, and strong suction vents should be located over the bath and close to the points where hot pieces are transferred to the press, or to cooling racks.—END



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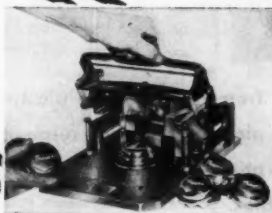
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Residual Strains

(Continued from pp. 97-108)

the effects may be so great as to render the results completely misleading, as, for example, in testing for resistance to various solvents.

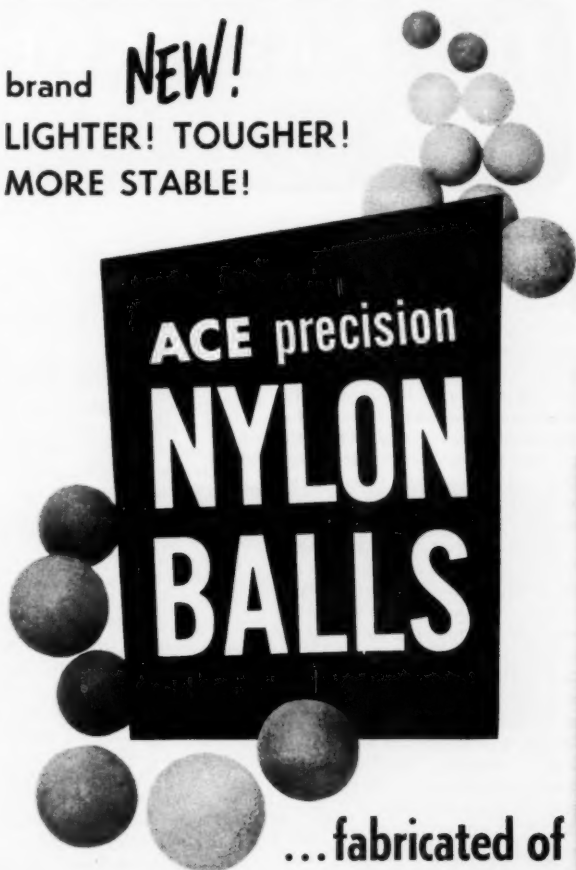
Occasionally, a further advantage may result from strain reduction. Less frozen orientation means a somewhat higher effective distortion temperature. With some pieces this means that the piece may be removed from the mold at a higher temperature without deforming objectionably thereafter. Thus, a shorter molding cycle and greater production rate may be achieved.

In practice, certain limitations are imposed by the molding equipment which may prevent optimum utilization of strain reduction. Ideally, one would like to seal the mold in the very early stages of packing to minimize frozen orientation. This is frequently impossible in production runs. The temperature of the plastic in the mold at the sealing point would be so high that not enough pressure could be applied to compensate and produce moldings within the dimensional requirements. Thus, a compromise must be made. It is to be hoped that improvements in injection presses in the direction of higher ram pressures and correspondingly improved clamping devices will alleviate this situation.

Another difficulty arises when a press is being operated at or above rated capacity, or the heating zone is not functioning efficiently for some other reason. In this case the plastic entering the mold is not heated uniformly; rather, temperature differences exist throughout the flowing material. This results in modification of the flow pattern and the frozen orientation pattern which may be recognized by a characteristic mottled appearance when the piece is viewed between crossed Polaroids. For some reason, strain reduction is less successful in such cases.

The picture which has been delineated for the formation of residual strains and the means of reducing frozen orientation, has been rather qualitative, of necessity. It is hoped that this will not detract unduly from the presentation, for considerable practical advantage may be realized by use of these principles.—END

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THE PLASTISCOPE*

NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

Materials Supply

It is indeed a strange economic world in which we live today. Plastics—along with many other basic materials—are being produced in far greater quantity than ever before, yet the subject of shortages is the most important single topic of discussion in the industry today. The purchasing agent who can go out and find enough materials to satisfy his production department generally merits a Presidential Award!

Practically every plastic material is in the shortage category. Even the small volume materials are on allocation—one producer of a styrene copolymer is reported to be taking orders only on promise of delivery six months hence. The big volume materials are in such state that one producer of polystyrene will promise delivery to new customers only on a 12-months-hence basis, and all orders are generally severely cut from the quantity desired. Yet the plastics industry consumed materials at a record rate of almost 2 billion lb. a year (exclusive of surface coatings) in August, the last month for which government figures are available (see page 129). September and October were probably higher. But chemical storage tanks of all types have been emptied and the pipe lines can no longer be filled from them. November and December will likely show a decline in production.

One reason for the probable decline in November and December is that in other years raw material companies have generally been able to build up an inventory of supplies in several months when sales failed to keep up with production. But in 1950 there has been no chance to build inventory. Materials moved out as fast as they could be purchased, and the last two months of the year find most raw material companies operating on a hand-to-mouth basis.

One-day, two-day, and even longer slow-downs crop out all over the industry due to shortages of ethylene, chlorine, phenol, styrene, alcohol—or any one of the needed basic materials because there isn't a drop in storage to tide over even temporary shortages in production.

Here's a brief run-down of some of the major materials in the same sequence as they are listed in the Government production report:

Cellulosic molding powder, exclusive of ethyl cellulose and Valite, reached over 8 million lb. in August—one of the biggest volume months since 1947—and probably went over that figure in October, but the shortage of cotton linters due to a poor cotton crop has finally made itself felt and will contribute to a probably small decline that may last for several months. A lack of sufficient plasticizers and alcohol helps further to complicate the problem. Ethyl cellulose may be affected by a shortage of ethylene chloride stemming from both ethylene and chloride.

Phenolic molding powder and laminating resin shortages go back to benzol. In all the hubbub over the polystyrene situation, little notice has been given to the ever increasing demand for phenolics. Molding powder production of 22 million lb. in August was the highest on record, and demand has not yet slackened. Production is running several million pounds ahead of sales each month, but there is no inventory in producers' hands. The difference in the figures is accounted for by several firms who produce a sizable portion of their own molding powder and don't report it as sales.

Phenol, made from benzol, is the phenolic bottleneck although it has been running along at record production rates of from 20 to 27 million lb. a month in comparison to an average of around 18 million in 1949. There is as yet no reported shortage of formaldehyde and wood flour used

in molding powder production. The future supply would seem to depend on availability of benzol if demand for molding powder keeps at its present high level. DO orders for government procurement have begun to show up in sizable quantities.

Melamine resin products have continued to be in demand with the result that consumption during the last half of 1950 hit an all-time high. During the last quarter, demand exceeded supply, and producers were forced to allocate their production. It is anticipated that this tight situation will extend into the first few months of 1951. During the latter part of January or the first half of February in 1951, additional facilities for the production of melamine are scheduled to be completed which will relieve this situation.

During the month of September, an unprecedented power shortage curtailed the production of calcium cyanamide, the basic raw material in the production of melamine. The curtailment fortunately proved to be temporary since a substantial restoration of electric power supply was soon obtained. Urea and melamine molding powder plus melamine laminating resin production was over 30 million lb. in the first half of 1951, and should be at least 10% more in the last six months.

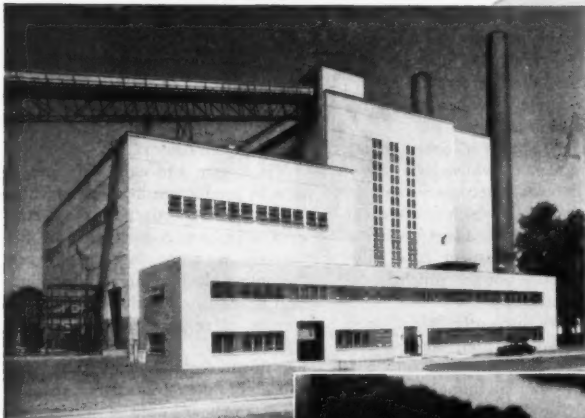
Polystyrene shortages have created the most confusion in the industry, yet molders bought over 25 million lb. in August—and nearly as much in both September and October. The trouble is they want still more—lots more. In 1949 they purchased 180 million lb. or an average of 15 million lb. a month. In the first eight months of 1950 they bought 175 million lb., or an average of 22 million lb. a month. It is believed that November and December production may drop to around 20 million pounds.

GR-S rubber production was running around 33,000 long tons a month in October. Since every 4000 long tons of rubber require 1000 short tons of styrene, the rubber made in October required about 8250 tons or 16,500,000 lb. of styrene. It is reported that the GR-S rubber production goal for January will be 50,000 tons which will require 12,500 tons or 25 million lb. of styrene monomer.

Styrene monomer production has recently been running between 47 and 49 million lb. a month. If that

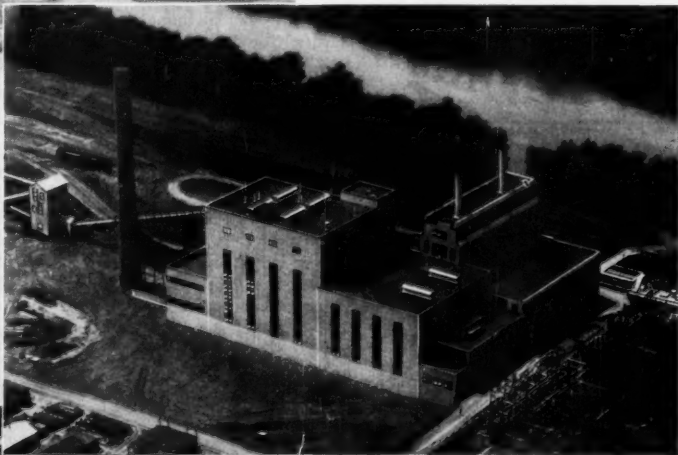
* Reg. U. S. Pat. Office.

WITH THE NEED CAME THE POWER



Virginia Electric and Power Company instituted an expansion program in 1944 to more than double their electric generating capacity. These new power stations and extensions, three of which are illustrated here, are outstanding examples of efficient design for consistently reliable year-in, year-out, high-capacity performance. Facilities for this program, completed and in process of completion, will produce a total of approximately one-half million kilowatts. Design and construction are by Stone & Webster Engineering Corporation.

1. *Chesterfield Power Station, first with an installed rated capacity of 50,000 kw, has been extended with an additional installed rated capacity of 60,000 kw.*
2. *Recently completed Brema Power Station extension, 60,000 kw rated capacity.*
3. *Possum Point Power Station where an extension of 60,000 kw rated capacity is under construction.*



STONE & WEBSTER ENGINEERING CORPORATION
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PLASTISCOPE

rate can be kept up there will still be some 20 million lb. of monomer for plastics production of the various types using styrene. The problem seems to be to find enough benzol and ethylene to make styrene monomer, but some producers claim there is enough benzol and ethylene in sight to keep them going.

GR-S rubber production is scheduled to go up to 63,000 tons per month later in 1951, but that isn't likely to be until March or April; the extra butadiene needed won't be available until the plant which converts alcohol into butadiene comes into production. Furthermore, it is possible that the government may decide to alter its rubber program and cut its present scheduled pro-

duction pattern to some extent. Other factors include the favorable test results shown by rubber containing a smaller percentage of styrene and a new rubber which requires only butadiene.

There are scores of other angles, including a more widespread use of benzol in other necessary defense program products which would make less benzol available for styrene, but the immediate prospect is a polystyrene supply not too much under present production.

Vinyls are currently "tight" with the cause laid to high demand and scarcity of chlorine. The future is even more complex than that of other plastics. The industry has tremendous capacity that hasn't yet been

used, but there is not enough raw material to pay to open them.

Furthermore, it is believed that there are large stocks of unsold film items on retailers' and distributors' shelves. No one is certain what will happen to this big inventory, but the optimistic film producers think it will move fast during the winter months. None of them seems worried about the situation—they all want more resin than they are currently obtaining.

Vinyl wire and cable covering is now in production in unprecedented quantities. DO orders for vinyl-covered wire, coated duck, etc., are beginning to come in. The biggest stumbling block to increased production is scarce chlorine and a limited supply of plasticizers. Chlorine is short not only because of production lost in the recent strike but also because of ever-increasing demand across the board—anti-freeze in particular being one of the latest to de-

S. P. I. Committee Reports on Polystyrene Situation

THE S.P.I. Injection Molders Committee on National Security, headed by Elmer E. Mills, president, Elmer E. Mills Corp., Chicago, Ill., reports that to date it has had conversations with G. B. Hadlock, director, Rubber Reserve; Senator Lyndon B. Johnson, chairman of the Senate Subcommittee for the Armed Services; and Arthur Wolf, in charge of the rubber section of the National Security Resources Board. The committee intends to maintain its policy of working with the administrative authorities rather than encouraging the industry to bring pressure through politicians to relieve the polystyrene situation.



Elmer E. Mills

The plastic material manufacturers are to meet with Rubber Reserve shortly and the committee will hold further talks with John R. Steelman, assistant to the President; W. Stuart Symington, chairman, National Security Resources Board; and other

administrative officials who can help in the matter.

The polystyrene molding material outlook is directly related to the GR-S synthetic rubber program. Had there been no stepping up of synthetic rubber production there would probably be enough polystyrene to keep busy the molding machines now installed and on order, even with the recent big increase in molding capacity. Any softening of rubber's demands on styrene monomer supply will help the situation. Here are some helpful factors:

1) Synthetic rubber output at a rate of 63,000 tons a month plus natural rubber imports now coming in at the rate of 75,000 tons a month, make a total of 1,660,000 tons on an annual basis; yet in the year of greatest consumption, 1947, the rubber industry consumed only 1,122,327 long tons of natural and synthetic rubber. It is obvious that, even with considerable stock piling, the synthetic rubber program is likely to far overshoot its requirements, which will inevitably mean a cut and a diversion of more styrene to plastics.

2) Credit curbs are causing sharp

drops in demand for new automobiles, and since each car uses about 120 lb. of rubber, a great saving can be expected there.

3) NPA rubber order M2 limits the civilian consumption of natural and synthetic rubber.

4) Butadiene rubber to the extent of 60,000 tons is to be produced, and tires made of this material with little or no styrene are proving durable under test.

It is conceivable that over the fiscal year July 1, 1950 to June 30, 1951 there will be enough polystyrene to permit the whole industry to run at between 10 and 20% over the average production rate of July 1, 1949—June 30, 1950. But the pace of material availability will probably not be steady.

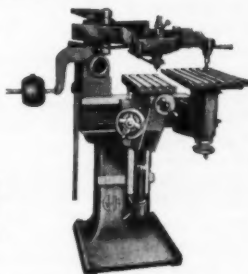
This month and next (January 1951) should not be too uncomfortable from a supply standpoint in relation to the July 1, 1949—June 30, 1950 average, but February, March, and even April will definitely be tighter as to polystyrene supplies. By the Fall of 1951, short of an all-out world war, the situation should have improved.

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PLASTISCOPE

mand unusually large quantities. Naphthalene and alcohol are the shortage items causing the greatest grief in the plasticizer supply line.

Printing on Polyethylene

A PROCESS for treating polyethylene prior to printing and that will reputedly prevent ink from flaking or pulling off after printing is being made available by E. E. Raymond of 300 W. Adams St., Chicago, Ill.

The distributor claims that printed polyethylene film which has been treated by this process will withstand the Scotch Tape test. The process, which permits the use of low cost inks, can be applied either at the printing machine or separately; if separately, the equipment required would cost in the neighborhood of \$1000 plus assembly costs. In actual production, the treatment cost is reported to be from 4 to 5¢ per 1000 square feet.

The distributor states further that ink applied to the treated surface will also resist moisture, boiling, and freezing; is highly resistant to removal by alcohol, mineral oils, and abrasion; and is not adversely affected by passage of time.

The process can be carried out on a continuous basis in keeping with the speed of rotary or other type printing of continuous lengths of film. Treatment may be performed either immediately prior to the printing operation or as long as several months in advance of printing.

Film Sales

AN interesting comment on the near future of vinyl film was given this reporter by J. P. Frank, head of Presto Plastic Products Co., Inc., during a discussion of possibilities for the next few months.

Mr. Frank believes that sales of vinyl film to the consumer will increase at an accelerated rate in the period under consideration. He admits that consumer purchases of vinyl film dropped during the summer and early fall months even though calender operators were operating at almost full capacity or as near full capacity as they could with

limited supplies of raw materials. It is presumed that large inventories have, therefore, been built up by printers and distributors, but that these inventories will soon disappear under an increased buying urge on the part of the housewife. Mr. Frank reasons that consumers spent a large part of their available funds for sugar, canned goods, toilet paper, rubber tires, and so forth, right after Korea because they recalled what happened to these particular materials at the beginning of World War II. He points out that now they are stocked up on these materials, but their husbands are still working—employment is probably at the greatest rate in this country's history—and people have money to spend. Furthermore, it is possible that the new credit requirements will cut into the demand for television sets, refrigerators, and other relatively high cost items. What is more likely, consumers will spend their available cash for vinyl drapes, bed spreads, garment bags, aprons, and so forth, which are comparatively low cost items. At this particular time vinyl goods will appeal to the general trade because cotton goods and other textiles are not only scarce but are higher priced.

The vinyl film industry is now in a much better position than ever before to satisfy the customers' whims, says Mr. Frank, because: "Today we are making film from 27 up to 72 in., from 3 up to 12 gage, in beautiful metallics, prints, and a large variety of embossed patterns all in very beautiful shades of colors which we were not able to offer before. Our spring line is open, and we are already doing business at a much earlier time than last year. We have a much larger variety of patterns than we have ever had before. The price of film has not risen as high in proportion, as other commodities."

Perhaps Mr. Frank has much the same idea as was expressed by buyers at the Hardware Show in New York last month who openly stated they were buying everything they could get their hands on despite the fact that goods were not moving too rapidly from retail shelves. Dealers

wanted to have merchandise on hand, for they remembered their shortages starting in 1942; hope they won't be caught with low inventories again; and are anticipating one of the biggest Christmas markets on the record books.

S. P. E. Conference

ATTENDANCE of 1000 technologists from all parts of the world is expected at the Seventh Annual National Technical Conference of The Society of Plastics Engineers, Inc., Jan. 18 to 20 at the Hotel Statler, New York, N.Y. The theme of the conference is "Plastics Shape the Future;" the technical papers to be presented will review achievements in plastics during the past 50 years and forecast the course of future developments during the next half-century. James T. Growley and Stanley Bindman are co-chairmen of an over-all arrangement committee for the conference which is jointly sponsored by the New York and Newark sections of the Society.

Variety in Vinyls

THE available variety of plastic-coated fabric and unsupported vinyl sheet, as well as the range of uses, may be illustrated by the statement that one manufacturer alone (Textileather Corp., Toledo, Ohio) carries 207 different products which include 91 vinyl-coated fabrics and 63 unsupported types for furniture and automotive upholstery items; 24 forms of vinyl for automotive trim; and four other categories with various items in each. Yet this diversity represents only 20% of the company's business; the patrons are largely jobbers who order only a few rolls at a time. The bulk of the company's volume is direct-order business from automotive, furniture, shoe, and other manufacturers who order special patterns in large quantity runs.

An idea of where all this material goes, aside from the automotive industry, is suggested by the operations of one furniture manufacturer which makes 1200 dinette sets a day. There are four chairs to the set, and ½ sq. yd. of 12-gage vinyl upholstery is used per chair.

Another example is illustrated in the recent announcement that the furniture used in the new \$5 million Toledo Union Station, including re-

HELP NEEDED!

First class opportunity for strong, light weight material with inherent insulating properties needed to mass produce refrigerator freezer compartment door and freezer baffle assembly. Material must be moisture resistant, odorless, low in cost, adaptable to high production schedules, have a minimum of thermal expansion and contraction, and satisfy decorative needs. Apply to Manager of Appliance Engineering, Crosley Division of Avco Manufacturing Corp., 1329 Arlington St., Cincinnati, Ohio.

For a better job at lower costs, you can depend on plastics for an outstanding performance. Like many cost-wise and quality-wise manufacturers, the Crosley Division of Avco Manufacturing Corp. found plastics to be ideally suited for the freezer door and freezer baffle assembly* in their latest model Sheldor.

The main function of the freezer door and freezer baffle assembly is to maintain a constant 0° - 10°F. temperature in the freezer compartment, while the refrigerator box is around 40°F. With previously tested materials, moisture-filled air would rise . . . condense on the freezer door and the result was an irksome, stuck door covered with ice. Crosley solved this problem by using a sandwich type freezer door and baffle assembly consisting of two panels of Styron 666 cemented together, with glass fiber insulation between. The many cost-saving and physical properties of Styron (Dow polystyrene) recommended its selection by Crosley.

Light weight Styron has excellent insulating properties. It's odorless, moisture-proof and it has a minimum of thermal expansion and contraction. Also, the wide range of built-in colors and easy moldability of low-cost Styron offered unlimited decorative possibilities, not available in other materials.

To help put Styron to work for them, Crosley called upon the skilled services of the Custom Molder. They found his knowledge and experience invaluable in solving plastics design and engineering problems. Perhaps you, too, have a production problem that can be solved by using plastics.

*PATENT APPLIED FOR

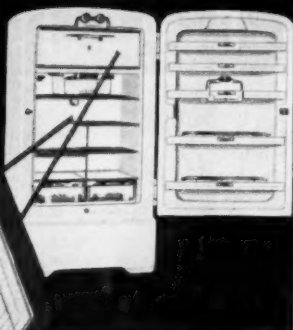
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Freezer door and freezer baffle assembly installed in Cambridge Molder Plastic, Cambridge, Mass. for the Crosley Division of Avco Manufacturing Corp.



IMPROVES INSULATING QUALITIES: Styron 666 was used in the freezer door and freezer baffle assembly with excellent results. With a minimum of thermal expansion and contraction, light weight Styron has inherent insulating properties that help maintain a constant frigid temperature in the freezer compartment.

SPEEDS PRODUCTION OUTPUT: Heavy production schedules are maintained because Styron panels in freezer door are mass produced by Custom Molder with uniformly high quality and color permanence that reduces finishing and assembly costs. To achieve a positive insulating seal, Styron panels are quickly cemented together with glass fiber insulation in between. This quickly assembled improved production output over previously tested materials that were bolted together.

DISTINCTIVE STYLING: The easy moldability of Styron permitted designers to shape distinctively styled freezer door that also serves as a rearranging shelf. With color built in, Styron offers many attractive decorative opportunities in a wide range of colors. Moisture-proof and odorless, Styron won't chip, peel or rust, and its excellent dimensional stability withstands the wide changes in temperature ranging from 0°F. to 110°F., encountered by refrigerators during shipping and actual use.

Plastics Division—Dept. SOT-57

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placements of the old-time wooden benches, is upholstered with a Textileather product.

There are several comparatively new items in the Textileather line. One of them, called Mustang, is a vinyl-coated fibrous cellulosic base. Many processors have found it highly satisfactory for low-cost luggage where its wearing qualities plus certain advantages in processing are desirable. For example, it can be sewn on a wooden luggage frame with the needle passing through both the wood and plastic or, if adhesives are preferred, the cellulosic base has excellent adhesion properties. Mustang is also extensively used in quarter linings for shoes, a business that consumes thousands of yards of material a month, a large percentage of which is said to be vinyl coated.

Non-Woven Fabric—Another recently developed company product is Feltone. This is a vinyl coating laid on a non-woven fabric with the unusual characteristic of having equal tear strength in any direction. In many respects it has the advantages of unsupported film or sheet including finish, feel, drape, and the ability to tailor easily, plus dimensional stability imparted by the non-woven fabric base. It has price advantages over many materials on which a woven cotton backing is used. Bed headboards, hassocks, table tops, wall coverings, automobile seat-cover trim, and other applications, which can make use of Feltone's particularly high degree of fidelity in holding puffed or quilted patterns, are particularly recommended for a trial in this material.

Still another recently introduced material which has taken five years to develop is Textilco, built especially to replace genuine leather in fine furniture and automotive upholstery and as a top for convertibles. The material is a nylon mesh or duck embedded in vinyl and is noted for its toughness. Another version of the same material is being tried out for heel pads under the pedals of cars.

These are only a few of the types manufactured by one single company; but they are certainly enough

to indicate the growing spread of an industry that a mere three years ago depended upon only two basic constructions—unsupported film or sheet and fabric-coated materials.

NPA Division Director

APPPOINTMENT of Joseph Sumner Bates, president of Bates Chemical Co., as director of the Chemical Div. of the National Production Authority has been announced by the U.S. Dept. of Commerce. Mr. Bates, a resident of Media, Pa., served as a Lieutenant-Colonel in the Ordnance Dept. of the U.S. Army in 1940 and was later connected with the WPB's Chemical Division. When General Aniline & Film Co. came under Federal control, he was named executive vice president of that concern, and in 1945 he was chief of a special mission for the Secretary of War to survey the I. G. Farben properties in Germany. On Jan. 1, 1947, he began a three-year term as president and director of Ciba Pharmaceutical Products, Inc. Prior to World War I, he was associated with Calco Chemical, and at one time was manager of the Development Dept. of the Marcus Hook Plant, National Aniline Chemical Div., Allied Chemical & Dye Corp. He became president of Bates Chemical Co. in 1924.

Low Cost Resin

MADE for use as an extender for most thermoplastics, Nebony, a hydrocarbon dark-colored thermoplastic resin with good odor, is being produced by The Neville Co., Pittsburgh 25, Pa. The resin is suggested for use in phonograph records, sound-deadening compounds, rubber compounding, electrical insulating compounds, plastics, floor tile, adhesives, wax compounds, pipe coating oils, and core oils. It is available in grades from tacky medium-hard to glossy brittle-solid and is soluble in ketones, esters, terpenes, naphthenes, and aromatic and chlorinated solvents, and partially soluble in aliphatic and ether-alcohol solvents. The various grades have melting points from 70 to 120° C. The price is from \$0.0425 to \$0.075 per pound.

In the plastics industry Nebony is recommended particularly for floor coverings and phonograph records. In mastic floor tile the low codine number of Nebony 120 makes this material attractive.

In phonograph records a very low-cost record could be made with a formula consisting of approximately 12% vinyl, 25% Nebony 120, plus the usual amount of filler, wax, and plasticizer. For a better record of the break-resistant type which might contain 30% vinyl, about 20% of Nebony might be used in the compound. It will improve the flow and lower the cost of such compounds, according to the producer.

Nebony is also suggested for use with injection molding thermoplastic compounds, especially polystyrene, ethyl cellulose, and vinyl. In laboratory tests it has been processed for hours at 250° C. without effect, and the producer claims it will increase heat resistance during the molding process.

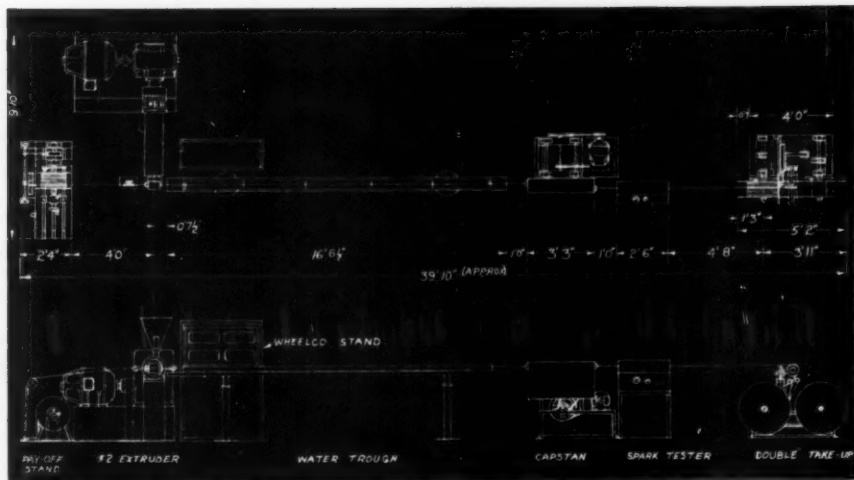
Christmas Dinner Dance

PLANs are being made for a joint S.P.I.—S.P.E. Christmas Dinner Dance and Entertainment to be held at the Edgewater Beach Hotel, Chicago, Dec. 9. The entertainment committee is headed by W. K. Woodruff, Plastics Div., Celanese Corp. of America, located at the firm's mid-western district office, 1514 Merchandise Mart, Chicago, Ill.

Vinyl Latex

LIKE all other materials in the vinyl family, vinyl chloride latex sales have been booming for several months. Among the principal customers is Burlington Mills, which is using the latex to impregnate the rugs in the back seat area and trunk compartment of Nash automobiles. The latex-coated carpeting has a modified jute felt base which is first impregnated with a rubber latex, then coated with poly-blend latex and embossed in a simulated carpeting effect.

One of the latest uses is by Treesdale Laboratories, Inc., Pittsburgh, Pa., which has announced use of the latex as a flame-proofing compound for protective clothing used in the Jones & Laughlin steel plants. The latex, called Permaproof 300, is available from Treesdale for application to all types of cloth. It is a liquid



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dispersion based on Geon latex and differs from many conventional flame-proofing materials in that it contains no pigment.

For years the only protective clothing available to steel companies was treated with compounds that would generally wash out after the garment was laundered. Fabrics treated with Permaproof 300, according to the manufacturer, are flame-resistant even after repeated laundering with any type of soap.

Continental Can Co. uses sizeable quantities of latex as a protective exterior coating on fiber shipping drums. The coating provides improved abrasion resistance over conventional coating lacquers, high gloss which gives the drums an attractive appearance, and a surface that can be easily washed. When packing fiber drums with certain products, spillage necessitates washing the outer surface, and this is made doubly difficult when no coating or an inadequate coat is used.

One company is packaging large quantities of vinyl latex for use as a Christmas tree spray to retard dropping of needles. Other uses include rug backing, textile treatment, and paper coating in the decorative and wallpaper field.

COMPANY NOTES

U. S. Rubber Co., Naugatuck Chemical Div., has announced price increases for polyvinyl chloride resins, including both Marvinol VR-10 and 20, of from 2 to 4¢ per pound.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has announced plans for the construction of a chemical plant at Memphis, Tenn., for the manufacture of sodium cyanide, at an estimated cost of \$7,500,000. The new plant will be managed by **James J. McIntyre**.

Textileather Corp., Toledo, Ohio, has purchased the plant formerly occupied by American Swiss Co. in that city. The buildings, containing approximately 100,000 sq. ft. of floor space, will be used primarily for storage purposes, according to **Jules D. Lippmann**, president of the com-

pany. This action was decided upon in line with the expanded defense business that is expected to develop, and in light of the company's experience with inadequate warehouse facilities during World War II, said Mr. Lippmann.

Rotex Rubber Co., Inc., specialist in the grading of rubber waste and vinyl and polyethylene scrap, has moved to 1-23 Jabez St., Newark 5, N. J.

Premier Thermo-Plastics Co., Box 292, Louisville, Ky., has announced it is now compounding thermoplastic formulations and offering them as preforms and in granulated form. **William B. Watkins**, vice president, is in charge of production.

B. F. Goodrich Chemical Co. has enlarged its New York sales office at 475 Fifth Ave. to include the entire 24th floor of the Farmers Loan & Trust Co. Building.

Nissin Chemical Co., Osaka, Japan, has signed a contract with **Chemical Construction Corp.**, 488 Madison Ave., New York, N. Y., covering engineering designs for a urea plant to be located at an existing plant site of the Nissin firm.

Reichhold Chemicals, Inc., has elected the following vice presidents of the company in charge of their respective divisions: **Harry Kline**, manager and technical director of the Phenolic Plastics Div. in Detroit; **T. S. Hodgins**, manager of the Pacific Northwest Division.

Pabco Products, Inc., is the new name of **The Paraffine Companies, Inc.**, 475 Brannan St., San Francisco 19, Calif. There is no change in management or policy.

Association of Consulting Chemists and Chemical Engineers, Inc., 50 E. 41st St., New York 17, N. Y., has elected the following officers for the coming year: **Erwin Di Cyan**, president; **Earl D. Stewart**, vice president; **Robert S. Aries**, treasurer; **Albert P. Sachs**, secretary.

Irrington Varnish & Insulator Co., Irrington, N. J., has appointed **L. V. Henderson**, 140 Walker St., S. W.,

Atlanta 3, Ga., as southern states representative.

The Panelyte Div., St. Regis Paper Co., 230 Park Ave., New York 17, N. Y., has announced plans to spend \$1 million for an expansion program at its recently completed plant at Kalamazoo, Mich. This plant has added over 50% to the productive capacity of the division.

The M. W. Kellogg Co., Jersey City, N. J., has added three specialists to its Plastics Dept. sales staff to take care of the expanding market for Kel-F, fluorocarbon-type thermoplastic: **Stanley W. Jones, Jr.**, **Jules A. Jupa**, and **Francis M. Ruggles**.

H & R Industries, 344 E. Walnut St., Nazareth, Pa., has installed an injection molding department with Reed Prentice 2- and 4-oz. machines.

Precision Specialties, Inc., fabricator of plastic toys, plans to build a \$400,000 plant providing 36,000 sq. ft. in the Los Angeles International Airport Industrial Tract, which is expected to triple present production capacity.

Dewey & Almy Chemical Co. has announced a \$500,000 expansion plan for its Lockport, N. Y., plant, to be completed by next June. The new capacity will increase production of Cry-O-Rap, a plastic film used for food packaging and storage.

The Manufacturing Chemists' Association, Inc., has opened an office at 330 W. 42nd St., New York, N. Y., supplementing its Washington office in the Woodward Building. Activities of the new office, headed by **Robert L. Taylor**, will be devoted to public relations and the servicing of members in the New York area.

Industrial Plastics, Inc., has moved to larger quarters at 3148 W. 32nd St., Cleveland, Ohio.

Monsanto Chemical Co. has appointed **R. K. Mueller** assistant general manager of the Plastics Div. in Springfield, Mass. **Dr. David S. Weddell**, director of the company's Western Div., will rejoin the firm's General Development Dept. in St. Louis.

General Electric Co.'s Chemical Dept. has opened a new sales office at the Shoreham Bldg., 806 Fifteenth St., N. W., Washington, D.C.

Plaskon Div., Libbey-Owens-Ford Glass Co., Toledo, Ohio, has an-

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nounced the establishment of a new Coating Resins Dept., headed by **Carleton Ellis, Jr.**, which will handle all operations connected with the development, manufacture, and sale of Plaskon coating resin products. The company also announced construction of a major new plant addition on its principal manufacturing site near Toledo for the production of alkyl plastic molding compounds. The additional capacity is expected to be in production by March, 1951.

Foster Grant Co., Inc., has sold the former **Universal Plastics** plant at New Brunswick, N. J., to the **Philharmonic Television Corp.** The building has been used as a warehouse by Foster Grant.

PERSONAL

Jeffrey R. Stewart has joined the Bureau of Yards and Docks, Navy Dept., Washington, D. C., as chemical engineer in paint and plastics technology. He has just completed a research job at the U. S. Army's Raritan Arsenal.

Albert T. Maasberg has been promoted to assistant production manager of the cellulose products division of **The Dow Chemical Co.**, Midland, Mich.

Philip H. Rhodes is now technical director for **Clopax Corp.**, Clopay Square, Cincinnati 14, Ohio. He was formerly vice president of Pennsylvania Coal Products Co.

Paul L. Eness has joined the Product Development Laboratory of **Acheson Colloids Corp.**, Port Huron, Mich., as research engineer. **Alfred E. Emms**, plant superintendent, has retired after 47 years with the concern.

Kenneth Millhiser has joined the sales staff of **Plax Corp.**, Hartford, Conn., in the New York City offices at 630 Fifth Ave.

Dr. Howard Lyle Gottlieb has been appointed development chemist for **Bjorksten Research Laboratories, Inc.**, Chicago, Ill.

Dr. Robert Nussbaum, general manager, **Serafon Resinous Chem-**

icals Corp., Ltd., Israel, has recently purchased \$200,000 worth of machinery which will enable his company to produce its own molding powders and plastic adhesives. The company's present products include coated textiles, plastic paints, and film products.

Dr. Nicol R. Smith has been named executive director of **The Franklin Institute Laboratories for Research and Development**, Philadelphia 3, Pa.

Dr. Franklin Strain has been appointed acting director of research in charge of the **Columbia Chemical Div. Laboratories of Pittsburgh Plate Glass Co.** at Barberton, Ohio. He has been with the company since 1937.

Osborne Bezanson has resigned as vice president and member of the executive committee of **Monsanto Chemical Co.**, St. Louis, Mo., to become president and a member of the board of directors of **Chemstrand Corp.**, jointly owned by **American Viscose Corp.**, and **Monsanto**.

Dave Chapman, Chicago industrial designer, has been elected president of the **Society of Industrial Designers** for the coming year. Since 1935 he has headed his own office, and was formerly head of the design division of **Montgomery Ward & Co.**

Dr. Gilbert Thiessen, former technical advisor for the Chemical Div. of **Koppers Co., Inc.**, has been named manager of the laboratory section of the company's central Research Department.

R. H. Kilgore has been appointed assistant manager of the **Films and Flooring Div. of Goodyear Tire & Rubber Co.**, Akron, Ohio.

Lyman H. Allen, Jr., formerly with **American Viscose Corp.**, has been named chief engineer of **Foster D. Snell, Inc.**, chemical and engineering consultant of 29 W. 15th St., New York 11, N. Y.

Thomas E. Giblin and **Guy M. Stone**, two pioneers in the **Plastics Div., General Electrical Co.**, Pittsfield, Mass., have retired. Mr. Giblin, who has been with the company for 37 years, was a specialist in the Tex-

tolite Div., forerunner of the present **Plastics Div.**, assistant manager of sales of custom molded plastic products, and, until his recent retirement, district sales manager in Chicago and then Detroit for the **Plastics Division**. Mr. Stone has been in charge of laminated plastics manufacturing for many years.

Deceased

Paul Pfeffer, one of the directors of **S. A. Mapre of Luxembourg**, builder of extrusion machines, died in Austria, Sept. 13, 1950, after a brief illness. Mr. Pfeffer was 53.

E. Richard Heckman, 52, development engineer of **Chicago Molded Products Corp.**, Chicago, Ill., died Sept. 7, 1950.

Dominic R. Siragusa, president of **Molded Products Corp.**, Chicago, Ill., and brother of **Ross D. Siragusa**, president of **Admiral Radio Corp.**, died recently at the age of 37 following a long illness. The deceased, who founded **Molded Products** in 1939, was a director of **The Society of the Plastics Industry**.

William B. Darling, 49, manager of the **Plastics Div., Riegel Paper Corp.**, New York 17, N. Y., died Oct. 28. He was formerly chairman of the **Reinforced Plastics Div. of The Society of the Plastics Industry** and a member of that society's executive committee.

MEETINGS

Nov. 30-Dec. 1—American Society of Mechanical Engineers, Rubber and Plastics Div., Hotel Statler, New York, N. Y.

Dec. 3-6—American Institute of Chemical Engineers, Annual Meeting, Neil House and Deshler-Wallick Hotel, Columbus, Ohio.

Mar. 5-9—American Society for Testing Materials, Spring Meeting, Cincinnati, Ohio.

Mar. 13-16—National Association of Corrosion Engineers, 1951 Conference and Exhibition, Hotel Statler, New York, N. Y.

S. P. E. Meetings

Dec. 11—Upper Midwest Section of S.P.E. at Esslingers' Cafe, 1927 University Ave., St. Paul, Minn. **James Corbin**, Minnesota Mining & Mfg. Co., will speak on "Plastics in the Tape Industry."

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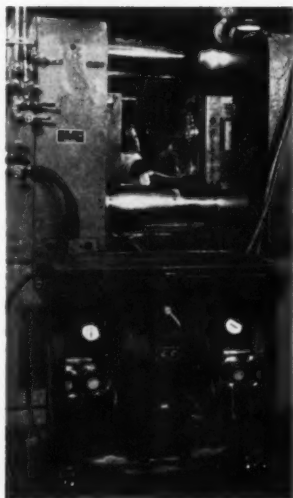


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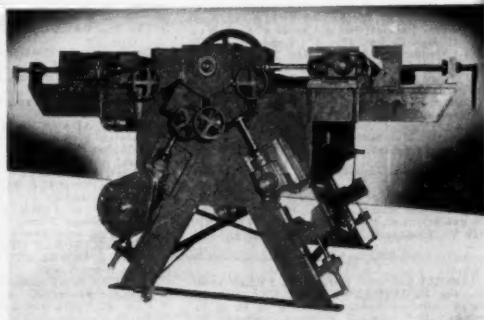
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FOR SALE: Rubber and Plastic Equipment. Farrel 18" x 45", 16" x 45" & 15" x 36", 2 roll rubber mills. New 6" x 12" Lab. mixing mills and calendars. Other sizes 36" to 84". Royle 222 perfected extruder, and other sizes. 300 ton Hydr. molding press 42" x 48". Field 500 ton 25" x 30", 300 ton F. B. Hydr. Molding Press 46" x 32"; 180 ton F. B. 26" x 20". Francis 175 tons 24" x 18". W. S. 115 ton 2 opening 24" x 24". 40 ton broaching press. Also press 20 to 500 tons from 12" x 12" to 36" x 36". Record Presses. Hydr. oil pumps. Vickers, Oilgear, Northern, etc. Watson Stillman 4 1/2" 4 plgr. 1-1/8" and 2-1/3" x 4" H & L pressure pump. HPM 1-3/8" x 6" vertical triplex 10 GPM 2700-lb. Elmes 1" and 1-1/8" x 4" hor. 4 plgr. 5 and 3 GPM 4500 lbs. and 5500 lbs. Elmes 2" x 8" Horis. 30 GPM 2500 psi. Ramsey 4 1/2" x 8" vert. triplex 65 GPM 900-lb. Hydr. steam pumps. Low pressure pumps 150 to 600 lbs. Hydr. accumulators. Stokes automatic molding presses. Stokes & Colton Rotary and Single Punch Tablet Machine 1/2" to 3". Injection molding machine 2 cu. to 24 cu. Baker Perkins jacketed mixers 200, 100, 50, 25, and 6.7 gal. capacity. Loomister 5 hp. plastic grinder. New and used rotary mixers. Mikro pulverizers, 2" fish and other sizes. Banbury mixers. Heavy duty mixers, grinders, pulverizers, etc. boilers, etc. Partial listing. We buy your surplus machinery. Stein Equipment Co., 99 West St., New York 6, N. Y. Worth 2-5745.

We handle hydraulic presses, pumps, and power units of all sizes. Write us your requirements and we will try to help you. We find it impossible to list our equipment in this classified column due to the fact that the equipment is sold before ad is published. For those who seek action look in the New York Times under the Machinery and Tool Column for our regular Sunday Special. Hydraulic Sal-Press, Inc., 345-50 Warren Street, Brooklyn 2, N.Y. MAIn 4-7847

SAVE WITH GUARANTEED REBUILT EQUIPMENT HYDRAULIC PRESSES, 24" x 34", 18" ram 318 tons; 24" x 46", 450 ton multiple opening; 24" x 24", 16" ram, 250 tons; 24" x 24", 12" ram, 170 tons; 24" x 42", 3-12" rams, 240 tons; 42" x 42", 12" ram, 250 tons; 36" x 36", 12" ram 141 tons; 20" x 15", 10" ram, 118 tons; 20" x 20", 10" ram, 118 tons; 19" x 24", 16" ram, 75 tons; 32" x 15", 8" ram, 75 tons; 27" x 21", 8" ram, 75 tons; 15" x 15", 8" ram, 75 tons; 12" x 12" 7-1/2" ram, 60 tons; 12" x 12", 6-1/3" ram, 50 tons; 8" x 9-1/2", 4-1/2" ram, 20 tons; 16" x 16", 3-1/2" ram, 12 tons; Laboratory Presses: 10 ton Carver 6" x 6", Watson Stillman 30 ton, 8" x 6"; Laboratory Mill-and-Calenders (NEW) M. D. THORPP Mill 18" x 48" M. D.; NEW DUAL PUMPING UNITS, all sizes; Extruders: Royle Rubber 22, Royle Plastic 21, PREFORM PRESSES, Stokes, T. Colton, 5-1/2 T and Stokes DD54 with Reeves Drives, also Mixers, Vulcanizers, Accumulators, etc.

FOR SALE: Ball & Jewell No. 1 Cutter; Double Arm Jacketed Mixer, 25 gal., 16 gal., 250 gal., 250 gal. Stainless. PERRY EQUIPMENT CORP., 1529 W. Thompson St., Phila. 21, Pa.

A LOOMIS 600 TON MOLDING PRESS available for IMMEDIATE DELIVERY! Self-contained; semi-automatic; 48" H. to 24", 36" platens; 28" opening between platens; 28" stroke up-moving; 0.002" maximum head deflection; knock-out bars; pullback cylinders; fast closing; mold opening. **FOR COMPLETE SPECIFICATIONS & INSPECTION CONTACT:** EVARTS G. LOOMIS CO., 126 South 14th St., Newark 7, N. J.; HUmboldt 2-5941.

FOR SALE: Model H-200 Van Dorn Injection Press, 2 cu. yd. Van Dorn, 22 mold base, 2-Phase motor. Practically new—used only 50 hours. P. O. Box 6350, Philadelphia 39, Pa.

FOR SALE: Injection presses: 4, 6 and 8 oz. Reeds, 4, 5 & 48 oz. HPM, 8 oz. Godelite, 3 oz. Munton. Extruder: 3-1/4" dbh. ext. oil heat. Royle. — 1-Cumberland No. 1-1/2 granulator. Ovens: 2-Impec Mold Temp. Circulators 1-6 vert. drawer Preheat Oven for 4 x 5 Acrylic or Royalite sheets. 1-300 ton Watson-Stillman Compress. press.—2-300 ton HPM Compress. press. also other sizes Compress. presses. 1-Laminat. press mult. op. 36" x 60" plat. 1-Stokes T preform press. 1-Kus No. 25 rotary preform. 1-Nash Rotary Edger. 1-Eclipse 3 HP gas boiler. 1-Aperx rd. obj. printing machine. Justin Zanner, 523 W. Waveland Ave., Chicago 13, Ill.

FOR SALE: Injection molding machines Lester type. One 2 ounce; ten 4 ounce; one 6 ounce. All in excellent running condition. Reply Box 754, Modern Plastics.

FOR SALE: Complete wood flour mill. Capacity 10 tons per 24 hours, using nearby supply of pine and poplar. For further particulars address Box 755, Modern Plastics.

FOR SALE: 1-Royle 21 Perfection Extruder with Oil Heating Unit & 5 HP Motor. 1-EEMCO 2-Roll Laboratory Mill 6" x 12" complete with motor. 1-Banbury 21 Mixer with 50 HP Motor. Reply Box 759, Modern Plastics.

PRICED TO SELL INJECTION MOLDING MACHINES

32-48 IMPCO Injector, '45 used in conjunction with standard plastic press. . . \$ 9,900.
12 Oz. REED PRENTICE, Mod. 10 H. . . 14,000.
16 Oz. REED PRENTICE, Mod. 10 E. . . 21,900.
16 excellent . . . Offers
12 Oz. IMPCO Mod. V.F. 832, 4 yrs. old . . . Offers
9 Oz. H.P.M. Mod. 200-80, new '39 . . . Offers
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2-1/2" x 25" class . . . Offers
6 Oz. WATSON STILLMAN new '42 good condition . . . 5,500.
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16" x 4" St. . . 4,950.
4 Oz. LESTER PHOENIX Mod. 11-V . . . 5,740.
4, 10 HP . . . Offers
4 Oz. H.P.M. Type K, Mod. 2K365A60 . . .
Mod. 100H, 16" St. 16 x 28 . . . 3,500.
2 Oz. REED PRENTICE new '37, good condition . . . 1,750.
HYD. PLASTIC PRESSES . . . Offers
300 TON DUNNING & BOSCHERT Semi-Automatic . . . 2,450.
200 TON WATERBURY FARREL 12" . . . 10,000.
St. 24 x 24 platens . . . 695.
260 TON BALDWIN LOCO WKS latest type '46 . . . 1,975.
360 TON SOUTHWICK 18" St. 18 x 36 platens rebuilt . . . 800.
54 platens S. C. . . 1,200.
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MERCER & ROBINSON FLOCK, Size 1624 for fine grind . . .
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PLASTIC BALL & JEWELL BEAD GRINDER . . .
1-1/2 Oz. PLASTIC NAIL or TACK HEADING MACHINE . . .
STOKES Mod. F, var. speed, used 3 mos. . . 750.
FALES CLICKERS, Style C, '47 equal to new. Ideal for cutting rubber gaskets, shims, and underlays . . . Offers
EVEREADY CO. E. J. McCallum, Prop. 805 Housatonic Ave. 4-9471, Bpt., Conn.

IMMEDIATE DELIVERY — 4 French Oil Mill Hydraulic Presses. From 300 to 1000 Ton — B & J Rotary Cutters 20, 21 & 22 — Injection Molding Machines 1-4-6-8 & 22 oz. all makes — Extruders 1/2" & 1" — Farrel 3 & 4 Roll Calenders up to 64" — Farrel 2 Roll Mills up to 48" — W & P Mixers all sizes — Preformers, single & rotary, all sizes, all makes. For Better Buys and Service — Phone South 8-4151-3264-8752. You Can Bank On The Equipment Clearing House, Inc., 289 10th Street, Brooklyn 15, N. Y.

FOR SALE: One ounce IMPCO molding machine complete with molds and loading device for manufacture of plastic topped tacks. Reply Box 763, Modern Plastics.

FOR SALE: 1 Stokes Model "R" Preform Machine 2-1/2" diameter x 2" max. depth of fill complete with variable speed drive, 4 Mears-Kane-Ofeldt 2 HP, 150 PSI Boilers, Sylvania Electric Products, Warren, Penna.

FOR SALE: 1 (one) 6" Allen tubing machine, high grade mixing chamber cover for steam or water, machine cut gears throughout, Marine thrust type bearings, with V-belt drive, and 40 H.P. motor. Used in our experimental department. Available at once. Phone 6-2479 Wells Manufacturing Company, 1791 South Main Street, South Bend, Indiana.

FOR SALE: 50 Ton Stokes Presses & Pump, 200 Ton W.S. Hobbing Press, 300 Ton W.S. PRESS 24 x 20 Platen, 175 Ton H.P.M. PRESS 30 x 30 Platen, 150 Ton Farrel PRESS 30 x 30 Elec. Platen, 140 Ton W.S. PRESS 23 x 17 Platen, 55 Ton Stewart Boiling PRESS 20 x 20 Platen, 50 Ton Elmes PRESS with 18 x 18 Elec. Plates, 75 Ton W.S. PRESS 15 x 15 Platen, 75 Ton Adamson PRESS 20 x 20 Platen, Laboratory Presses, Accumulators, Piston and Oil Pumps. AARON MACHINERY CO., INC. 45 Crosby St., N.Y.C.

FOR SALE: Thermex Preheater. Model 2P; Airtronics Preheater, Model D E; Airtronics Preheater. Model C B. Like new. AARON MACHINERY CO., INC. Worth 4-9233 45 Crosby St., New York 12, N. Y.

Machinery and Equipment WANTED

WANTED: Single Stroke Preform Machine 75 to 100 tons Capacity Preform Capacity 4" Dia. x 2" Thick Xtr. or Defiance Preferred. Reply Box 762, Modern Plastics.

New Mr. wants injection molding machines also extruding equipment. Will pay good prices. Reply Box 764, Modern Plastics.

WANTED: 3 KW Electronic Sealing Machine Thermatron Type No. 305 or equivalent. Reply Box 776, Modern Plastics.

Materials Wanted

WANTED: PLASTIC Scrap or Rejects in any form: Acetate, Butylate, Polystyrene, Acrylic, Vinyl Polyethylene, etc. Also wanted surplus lots of phenolic and urea molding materials. Custom grinding, magnetizing and compounding. Reply Box 744, Modern Plastics.

WANTED: Titanium Dioxide Pigments (any grade) needed to carry on our business. Not interested in any 55c or 95c Black Market deals. Would appreciate a few bags from manufacturing concerns who can possibly spare some. Will pay any reasonable premium or exchange for other critical chemicals. Samuel Smith Chemical Co., 410 Frelinghuysen Ave., Newark, N. J.

(Continued on page 170)

THE
"WELD"
DRESSED
GIRL

CARRIES WELDED
PLASTIC
ACCESSORIES



SEALED ON THE
THERMATRON
HIGH FREQUENCY SEALER



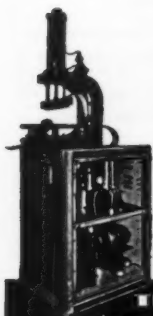
GALS CERTAINLY look mighty trim when their plastic accessories are sealed the modern *electronic* way. That's because many plastics fabricators are taking advantage of the wealth of design possibilities available to them in the THERMATRON.

The lady pictured here has just taken her plastic wallet from her plastic handbag. A key case and cosmetic kit are hidden there, too, as well as a new Kleenex container. Naturally, they are all made of vinyl and sealed on the THERMATRON! Don't overlook the smart new luggage "long-bound" in plastic, only because THERMATRON made it possible.

Your vinyl products will respond to THERMATRON's magic touch—both style-wise and production-wise . . . for electronic welding is faster, stronger, lower in cost than stitching.

Standard THERMATRON models from 1/4 KW to 6 KW weld vinyl from .002" up to .080", serving most requirements—or we can build to your special application. Equipment also available for sealing cellulose acetate, and for electronic gluing of furniture and other wood products.

Our engineers will make recommendations regarding your plastic sealing problem without obligation. A copy of our catalog No. 56 on request.



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\$100 "DE-STA-CO" CLAMP INVESTMENT

**saves
over**

\$5000 each shift per year



A saving of 12 man-hours per shift is reported by Ross Operating Valve Company with this fixture, built around 24 "De-Sta-Co" Model #620 Toggle Clamps.

The fixture holds Ross 4-Way air operating valves during a "run-in" operation. The clamp plungers are tipped with rubber grommets which seal exhaust and intake ports during the "run-in," after which the valves are torn down and inspected carefully. Besides the actual saving in man-hours, these "De-Sta-Co" Toggle Clamps convert a tedious setup job into one quickly and accurately performed by less highly-skilled labor.

Plastics fabricators can use setups similar to this fixture for cementing, bonding, or machining of plastics parts. Features making "De-Sta-Co" Toggle Clamps "the answer" for tooling up these operations include

- Rapid toggle action for speedy positioning of work
- Precision construction that assures perfect work alignment
- Low first cost, making possible efficient, inexpensive fixtures
- Wide range of models . . . a type for every application

For your problem in production work-holding there's a "De-Sta-Co" Toggle Clamp that assures increased efficiency, accuracy and savings. Whether you're machining, gluing, bonding, inspecting or assembling plastics parts, you do it faster . . . and cheaper . . . with "De-Sta-Co" Toggle Clamps.

Our catalog describes more than 40 fixtures and portable models, holding capacities over 2500 lbs. "De-Sta-Co" template sheets, full and half-scale, speed design of tools and fixtures . . . trace right onto your layout! There's a free set for you, if you're responsible for tool design. Write for your catalog, template kit, and name of nearest "De-Sta-Co" distributor.

**DETROIT
STAMPING
COMPANY**

327 MIDLAND AVENUE
DETROIT 3, MICHIGAN

CLASSIFIED ADVERTISING

(Continued from page 168)

WANTED: PLASTIC SCRAP or REJECTS in any form: Cellulose Acetate, Butyrate, Polyethylene, Polystyrene, Vinyl, Acrylic and Ethyl Cellulose. Reply Box 745, Modern Plastics.

Proprietary Charm, Toy, Prize and Novelty Molder. Will buy your scrap Acetate and Polystyrene injection molding powder or reject parts—and will appreciate getting it, with thanks and immediate cash payment. Samuel Eppig & Co., Inc., 91-15 144th Place, Jamaica 2, N. Y. Phone AXtel 7-2900.

WANTED: Plastic Scrap, Rigid Vinyl, Cellulose Acetate, Polystyrene, Polyethylene, Butyrate, Custom grinding, magnetizing, compounding, and straining of contaminated plastics. Franklin Jeffrey Corporation, 1671 McDonald Avenue, Brooklyn, N. Y. ES 6-7943.

Tupper Corp. will pay top market price for good clean Polyethylene, Polythene, S-Polymer Styrene, Dark or discolored material such as above. Write Mr. John Howdy, Tupper Corp., Farmumville, Mass., or phone GRAFTON 481, 482, or 483.

WANTED: Your Scrap Vinyl, Polyethylene, Polystyrene, Acetate, Ethyl Cellulose, and etc. OFFERING: Reprocessed Granulated Plastic, Custom Grinding, and Straining, Reun Industrial Plastic & Textile Company, 72 Woolsey Street, Irvington, N. J.

SURPLUS UREA MOLDING POWDER WANTED. Reply Box 769, Modern Plastics.

HELP Wanted

WANTED for injection molding plant in the New England area: Engineer with mold manufacture and general thermoplastic production experience. State full particulars. Reply Box 746, Modern Plastics.

WANTED: Assistant Molding Supervisor for large injection molding plant located in the New England area. State experience, age, education. Reply Box 747, Modern Plastics.

A rapidly expanding manufacturing concern in Connecticut needs an experienced resin and rubber chemist to direct the activities of its industrial lab. Experience in the abrasive field is desirable, but not essential. Reply Box 749, Modern Plastics.

WANTED: Sales Representative for established Michigan injection molder to cover midwest territory on salary basis. Engineering and sales background desirable. Reply Box 751, Modern Plastics.

WANTED: Phenolic Resin Chemist for development work in molding and laminating resins. Should have two to three years experience in the phenolic field. Please send resume and include salary expected. Reply Box 756, Modern Plastics.

EXPERIENCED VINYL TECHNICAL MAN: One who is thoroughly familiar with the compounding and casting of plastisols and organosols. State experience, education and salary desired. All replies confidential. The Floyd A. Hoies Company, Bedford, Ohio.

RUBBER and PLASTICS ENGINEER: To act in staff capacity in development, design, testing, production application, and vendor contacts on rubber and plastic materials used in high-performance military aircraft. Engineering or science degree required, plus four years' experience in aircraft or related fields concerned with product application. Contact Engineering Personnel Section, Chance Vought Aircraft, Division of United Aircraft Corporation, P. O. Box 5907, Dallas, Texas.

Situations Wanted

Many years experience in all types of plastic fabricating, injection, extrusion, calendaring, lamination, etc. Straight commission basis. Have extensive following. Reply Box 750, Modern Plastics.

ARTIST, DESIGNER, SCULPTOR: age 35, international reputation, winner of Prix de Rome, and many other awards. 15 years experience in both commercial and fine arts fields. Desires connection. Reply Box 752, Modern Plastics.

Editor and writer desires position with house organ or trade magazine where knowledge of plastics can be utilized. Experience includes editing and reporting on daily and weekly newspapers, free lancing for magazines; editing and producing books, brochures, bulletins, catalogs. Has excellent technical background in plastics. Reply Box 761, Modern Plastics.

EXECUTIVE PLASTICS ENGINEER: Former chief engineer and plant superintendent of plastic plant; presently in charge of product design, tooling and plastic manufacturing of AAAI for manufacturer. Desires permanent affiliation with progressive concern. Thoroughly experienced in custom and proprietary injection molding, product and mold design, all phases of manufacturing and plant management. Interested in top level propositions only. Reply Box 755, Modern Plastics.

Executive: Engineering Degree; Plastics since 1934. Ten years experience in compression, transfer and injection molding. Experienced in supervision, department head. Well versed problems of management, production, product design, construction and maintenance of dies and equipment, estimating, sales service and material control. Salary commensurate with ability and opportunities for advancement. Reply Box 765, Modern Plastics.

LAMINATION, EXTRUSION, COATING. Production and development. Experienced as technical director in both electrical and chemical fields. Textiles, papers, films and flexible metals industrial and defense packaging materials and products including pipe and thin polyethylene film. Inorganic and organic resins and rubbers. Can be available for two days per week on permanent basis. Reply Box 766, Modern Plastics.

Miscellaneous

FOR SALE: Dies for injection molding. Toy of saloon automatically climbing rope. Die has 12 cavities for major production, also 30,000 complete unassembled pieces in polystyrene, display cards, etc. Total inventory, our costs including dies, approximately \$18,000.00. Die brand new. Cost of die \$6,000.00. Will sacrifice to quick buyer. Reply Box 753, Modern Plastics.

EXTRUSION facilities available in Philadelphia area on contract or rental basis. Reply Box 757, Modern Plastics.

INJECTION MOLDS WANTED: Reputable Southern Manufacturer. We will purchase or rent molds for toys, housewares, novelties or packaging containers. Reply with price, samples and complete information on molds to Box 748, Modern Plastics.

FOR SALE: 30 tons Isobutyl Methacrylate Polymer; 15 tons Aroclor 1270; 2 tons Aroclor 2565; 5000 gallons Cellulose Acetate in Diacetone Alcohol. Chemical Service Corp., 96-01 Beaver St., New York 5, N. Y.

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Consisting of (1) 2 KW electronic PREHEATER, (4) 200 ton WATSON STILLMAN HYDRAULIC PRESSES 16" x 18" x 16" x 24" platens, (10) FAMCO 1 1/2 ton ARBOR PRESSES 8" x 8" platens, (1) 6 HP gas fired high pressure boilers, (3) 3 stage hydraulic WATSON STILLMAN, WORTHINGTON, GOULD pumps, (2) PORTER CABLE POLISHERS, (1) 8" SWING ENGINE LATHE, (1) DELTA PUNCH PRESS, (7) WATSON STILLMAN hand operated hydraulic pumps, (1) 2 1/2-6 ROYLE EXTRUDER, (1) 22 ABBE ROTARY CUTTER MD.

WRITE WIRE PHONE CHEMICAL & PROCESS MACHINERY CORP., 146 Grand St., New York 13, N. Y. Phone: WO 4-8130.

HAVE YOU A GIFT OR HOUSEWARE PRODUCT THAT NEEDS TOP PROMOTION? Let us do for you what we have done for others. Let us merchandise your product in our successfully proven way. Get the maximum sales volume through our nation-wide sales outlets. It will mean more profits for you. We are wholesale distributors and will carry stock. Reply Box 760, Modern Plastics.

ATTENTION MANUFACTURERS ! ! ! Years of experience selling chains and wheelers. If it's business you want, contact Allen Sales Company, 336 Broadway, New York 13, N. Y.

WANTED: To Buy A Small Compression Molding Plant. State full particulars, description of equipment, etc. Reply Box 767, Modern Plastics.

DO YOU NEED NEW IDEAS NEW PRODUCTS NEW BUSINESS NEW MONEY DO YOU WANT

TO SELL YOUR COMPANY Executive with extensive background in plastics industry and New Product Development desires to buy 50 or 100% interest in small or medium sized established plastics concern in the East. Perhaps we can serve each other. Reply Box 768, Modern Plastics.

WANTED small plastic items suitable for attachment to, or inclusion with, greeting cards. Especially want items with humorous, trick, joke, or seasonal nature. Submit prices with samples to Herbert of Hollywood, 1109 North Poinsettia Place, Los Angeles 46, California.

Patent now pending on useful plastic article for the kitchen and dining room. Should retail for thirty cents. Since there has always been a demand for an item of this nature the sales possibilities should be enormous. Will require large manufacturing plant to handle. Article available on royalty basis. Address Gay M. Hamilton, 1654 North Decatur Road N. E., Atlanta, Ga.

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For further information address Classified Advertising Department, Modern Plastics, 122 E. 42nd St., N. Y. 17, N. Y.

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December • 1950

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Standard of the World

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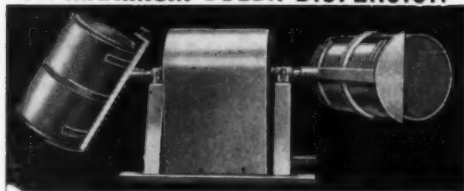
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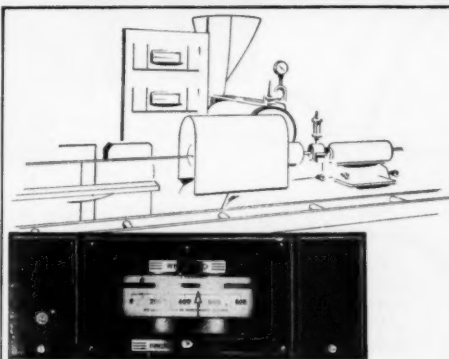
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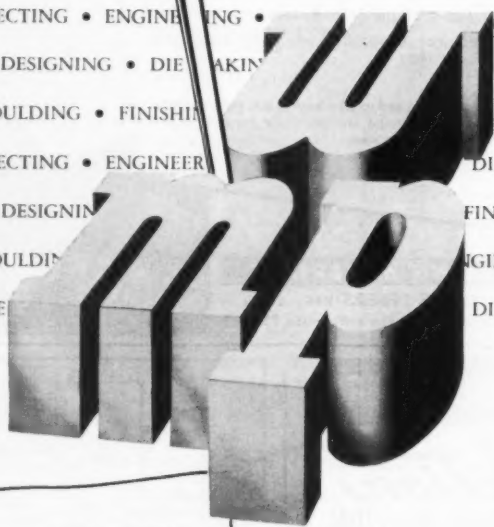
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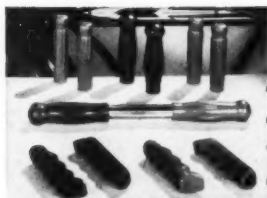


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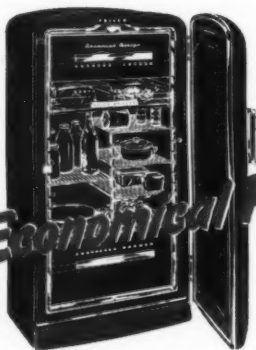
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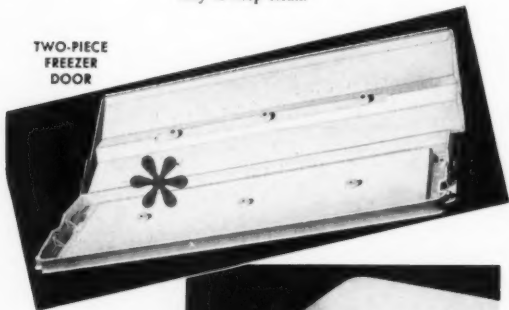
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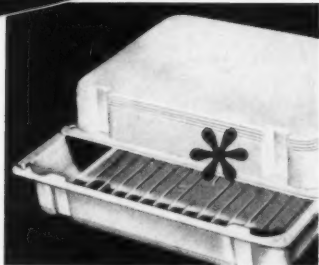


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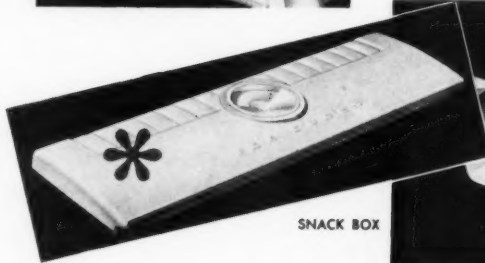
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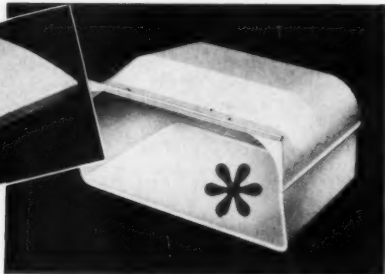
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